Groundwater Monitoring Report

Champlain Cable Site
Colchester, Vermont

VTDEC Site No. 770046

Prepared by:

Hercules Incorporated
Hercules Plaza
1313 N. Market Street
Wilmington, Delaware 19894

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1.0 INTRODUCTION

Hercules Incorporated (Hercules) is a previous owner and operator of the site now owned and operated by the Champlain Cable Corporation (Champlain Cable Site). The facility is located at 12 Hercules Road in Colchester, Vermont (See Figure 1).

In response to concerns about groundwater contamination by chlorinated volatile organic compounds (CVOCs), Hercules constructed a permeable reactive barrier groundwater treatment system (PRB System) in the fall of 1998. Hercules submitted in February 1999 the, "Report on Construction of Groundwater Treatment System," (the Construction Report). The State of Vermont, Agency of Natural Resources, Department of Environmental Conservation, Waste Management Division, Sites Management Section (VTDEC) by letter of May 7, 1999, indicated that the VTDEC had reviewed the report and had no comments on it.

Pursuant to the VTDEC approved Corrective Action Plan, dated March 5, 1998, Hercules is performing "Performance Verification Monitoring," as described below.

- Monthly water level measurements of selected wells located upgradient and downgradient of the PRB treatment zones and the cutoff walls to document groundwater gradients and directions.
- Quarterly water quality monitoring for inorganic parameters (i.e., sulfate, chlorides, carbonates, nitrates, phosphates, total dissolved solids, calcium, magnesium, potassium, sodium, iron and manganese) and field parameters (i.e., dissolved oxygen, pH, Eh, temperature, specific conductance, and alkalinity) at selected wells to identify changes in groundwater chemistry which may be occurring.
- Quarterly water quality monitoring for chlorinated volatile organic compounds (CVOCs) by EPA Method 8010 at selected wells to ensure that CVOC capture zones are being maintained. While the CAP indicated sampling within PRB treatment zones, on the recommendation of EnviroMetals Technology, Inc. (ETI),

monitoring wells were installed only on each side of the barriers, as described in the Construction Report.

Hercules retained Severn Trent Laboratories, Inc., (STL) to conduct the groundwater monitoring fieldwork and analytical evaluations.

Hercules submitted to the Vermont DEC on June 16, 1999, a "Groundwater Monitoring Report," (Hercules Incorporated, June 1999). The June 1999 report described the groundwater monitoring for the period November 1998 through May 1999. ETI provided comments on the June 1999 Groundwater Monitoring Report in a letter dated September 10, 1999. The ETI letter is attached as Appendix A.

Hercules redeveloped wells DG1D and EG4D and installed three additional monitoring wells in May of 2000 at the recommendation of ETI. The boring logs/well details are attached in Appendix B.

This report adds the results of monitoring through September 2000. ETI provided additional analysis and comments by letter of November 15, 2000. This letter is attached as Appendix C.

2.0 FIELD METHODOLOGY

STL performed the fieldwork for the groundwater monitoring. Sampling plan and methods were consistent with EPA SW-846.

The wells for monitoring wall performance are generally installed in pairs. The shallow well of each pair monitors the sandy layer. The deep well of each pair monitors the underlying silty layer. Due to its length, Gate A originally had three pairs of wells in the influent to and three pairs of wells on the effluent side of the wall (See Figure 2). Gates D, E, and W each had one pair in the influent to and one pair on the effluent side of the wall (See Figures 3, 4, and 5, respectively). With the installation of the new wells in May 2000, an additional pair of wells monitors Gate D (See Figure 3A). One additional well monitors Gate A (See Figure 2A).

3.0 RESULTS

3.1 Monitoring Well Condition

STL inspected each well at each monitoring event. All wells were in acceptable condition at each monitoring event, except in February 1999, when four wells were not accessible due to ice.

3.2 Groundwater Flow

STL measured the depth to water in all of the wall performance monitoring wells. Water levels were converted to elevations using survey data for the site. Mr. Ian Jewkes, a State of Vermont Licensed Land Surveyor, surveyed the location and elevation of the monitoring wells in 1998 and the additional wells in 2000. Table I-H shows the hydraulic head differences along the gate transects based on the water levels measured in June and September 2000. The hydraulic head differences along most of the well transects indicate the groundwater flows through the treatment zones, consistent with the previously determined groundwater flow direction. However, the measurements along the deep well transect at Gate A (AG9D-AG12D) and Gate E (EG2D-EG4D) indicate a reversed hydraulic gradient at these locations in June 2000. On evaluation of the water level data in all monitoring wells at these gates, it appears that water elevations in June 2000 in wells AG21D and EG2D are anomalous. No anomalous groundwater levels were observed in September 2000, which can be attributed to the redevelopment of the monitoring wells before the September 2000 monitoring. Based on the hydraulic gradients measured in September 2000 and the hydraulic conductivities from tracer tests (CAP, 1998), groundwater velocities for the last monitoring period were estimated by ETI. The estimated values are significantly higher (up to 36 fold higher in the deep aquifer and up to 12-fold higher in the shallow aquifer) than the velocities estimated based on the water balance at the site (CAP, 1998). The residence times in the deep part of the aquifer appear equal to or higher than the design residence times in Gates A, D, and E. In Gate A and W, the residence times in the shallow aquifer appear to be lower than the design values. Table II-H indicates the number of pore volumes (PV) that have passed between the upgradient face of the gates and the downgradient monitoring wells at the end of the monitoring period. Steady state conditions (i.e., optimal removal efficiency) are usually established in the iron system after the passage of about 40 PV. By September 2000 the number of pore volumes that had passed between the gate and the downgradient well was less than 40 only in the deep well transect at Gate D (Table II-H).

3.3 Chlorinated Volatile Organic Compounds

Consistent with our previous report, when a compound was not detected, the detection limit is listed with the symbol "U". When a CVOC was undetected, we used a default value of 1 ug/l for graphs and statistical analyses. This avoids the indication of a trend, when the only difference was the detection limit, which ranged from 0.5 to 100 micrograms per liter (ug/l).

Based on the June and September 2000 monitoring data, all CVOCs entering Gates E and W were treated to below the target cleanup levels (TCLs), as shown in Figures 6 and 7. These results are consistent with analytical data obtained during previous monitoring events. Previous monitoring events have appeared to indicate that some CVOC concentrations in downgradient wells at Gates A and D did not meet the target cleanup levels. As indicated in their letter (ETI 11/15/2000), ETI believes, based on their experience at other installations, that the contaminants are treated in the gate and the observed downgradient levels are the result of residual contamination caused by contaminant desorption and/or incomplete flushing in the aquifer material. The influence of residual contamination on downgradient CVOC concentrations can be discerned based on examination of temporal trends in CVOC concentrations along well transects in the system. For example, in the middle well transect at Gate A, the 11DCA concentration in the downgradient well remained relatively constant in six sampling events, whereas the concentration of 111TCA (a parent compound of 11DCA) varied from 1,200 to 3,900 ug/l in the same period (Figure 8). If the degradation of 11DCA was not adequate in the gate, it would be expected that the 11DCA-concentration trend would follow the trend of the 111TCA concentration.

Based on ETI's recommendations, additional monitoring wells were installed in the downgradient section of Gates A and D (See Figures 2A and 3A). Results obtained from these wells should not be influenced by the residual contamination. In Gate D, some downgradient CVOC concentrations appear to exceed the TCLs, particularly in wells screened in the deep aquifer (See Figures 7 and 8). In fact, in both sampling events, the concentrations of 11DCE, 111TCA, and 11DCA in deep downgradient wells were higher than in the upgradient concentrations (See Figures 7 and 8). However, the results obtained from wells located in the iron zone show that indeed the concentrations of all contaminants in the treated groundwater were reduced to below the TCLs (See Figures 7 and 8). As indicated above the CVOC concentrations measured in the wells installed within the iron zone appear representative of groundwater treated by granular iron and unaffected by residual contamination. Thus ETI concluded that the groundwater exiting Gate D meets the TCLs for the CVOCs.

The concentrations of PCE, TCE, and 111TCA in the downgradient wells at Gate A were below the TCLs in both sampling events (See Figures 7 and 8). However, the downgradient concentrations of 11DCE and 11DCA measured in the middle deep well exceeded the TCLs (See Figures 7 and 8). The 11DCE concentrations in the deep transect were reduced from upgradient values of 150 and 300 ug/l to downgradient values of 21 and 8 ug/l in June and September 2000, respectively. In the same transect, the 11DCE concentration measured in the deep well inside the gate were 5 and 14 ug/l in June and September 2000, respectively. The downgradient 11DCA concentrations at Gate A were also above the TCLs in the middle deep-aquifer monitoring well (See Figures 7 and 8). In this transect, the upgradient concentrations were non-detect and 182 ug/l, whereas the downgradient concentration equaled 330 and 690 ug/l in June and September 2000, respectively. Note that the sample taken concurrently from the well installed inside the gate, as a part of this deep transect, showed 11DCA concentrations of 160 and 190 ug/l for the two sampling events, respectively (See Figures 7 and 8). Both of these concentrations are lower than the corresponding downgradient aquifer concentrations. Dechlorination of 111TCA produces 11DCA and accounts for about 40% of 111TCA breakdown products. Assuming this conversion rate (which was observed in numerous laboratory tests), and the incoming concentration of 111TCA ranging from 3,000 to 3,900 ug/l (See Figures 7 and 8), about 1,200 to 1,500 ug/l was likely formed inside the iron zone. The low 11DCA concentrations measured in wells inside and downgradient of the gate, compared to these peak values generated from the 111TCA breakdown, indicate that the 11DCA degradation does occur inside the gate. At the present time, ETI cannot explain why the degradation of 11DCA in the deep zone appears incomplete. Based on groundwater monitoring, the residence time at Gate A is about 11 days (Table II-H). ETI is convinced that this residence time would be sufficient for complete degradation of up to 1,500 ug/l of 11DCA. For example, assuming the design 11DCA half-life of about 40 hours, about eight days would be required to degrade 1,500 ug/l of 11DCA to below 70 ug/l.

3.4 Indicator Parameters

Tables I-IND through VIII-IND show the results of the analyses for groundwater Indicator parameters. Results for each compound are discussed below.

3.4.1 Chloride

On average for all wells and gates chloride concentration ranged from about 17 to 50 mg/l. There was less than 5% difference between upgradient and downgradient sides of the PRBs.

3.4.2 Bicarbonate alkalinity

On average for all wells and gates bicarbonate alkalinity ranged from about 40 to 100 mg/l. The decrease in bicarbonate alkalinity across the PRBs ranged from an initial about 50% to about 10%.

Note: We found no hydroxide alkalinity in any of the samples.

3.4.3 Sulfate

On average for all wells and gates sulfate concentration ranged from about 4 to about 20 mg/l. There was about a 50% decrease in sulfate across the PRBs.

3.4.4 Nitrate Nitrogen

On average for all wells and gates nitrate nitrogen, as N, concentration ranged from about 0.2 to 0.35 mg/l on the upgradient side and was consistently below detection concentration on the downgradient side. There was about a 50% decrease in nitrate-nitrogen across the PRBs.

3.4.5 Total Phosphates

On average for all wells and gates Total Phosphates, as P, concentrations were about 2 to 5 mg/l on the up and down gradient sides of the PRBs. The gates do not appear to affect the Total Phosphates concentrations.

3.4.6 Total Dissolved Solids

On average for all wells and gates Total Dissolved Solids (TDS) concentrations were about 200 mg/l on the up and down gradient sides of the PRBs. The gates do not appear to affect the Total Dissolved Solids concentrations.

3.4.7 Dissolved Oxygen

On average for all wells and gates Dissolved Oxygen (DO) ranged from about 2 to 6 mg/l. There was about 35% reduction in DO across the PRBs initially, but the difference has diminished to hardly any difference.

3.4.8 Groundwater pH

On average for all wells and gates the pH ranged from about 6.5 to 8.0 standard units. The pH did not change appreciably between the upgradient and downgradient sides of the PRBs.

3.4.9 Specific Conductance

On average for all wells and gates the Specific Conductance ranged from about 250 to about 500 uS/cm. An initial difference has diminished.

3.4.10 Temperature

On average for all wells and gates the Temperature ranged from about 8 C to 18 C. There was little difference between upgradient and downgradient temperatures. Temperatures varied seasonally, as expected.

3.4.11 Oxidation Reduction Potential (ORP)

On average for all wells and gates the ORP ranged from about -100 to 140 millivolts (mV). The ORP is reduced by passage through the gates.

3.5 Minerals

Results of analyses for minerals are shown in Tables I-MIN through VIII-MIN. Specific results for each parameter are discussed below.

3.5.1 Calcium

On average for all wells and gates the total calcium concentration ranged from about 16 to 30 mg/l. The calcium concentration appears to decrease as groundwater passes through the gates.

3.5.2 Iron

On average for all wells and gates total iron concentration ranged from about 150 to 1,500 ug/l. The overall concentration increased on average of both sides of the PRBs.

3.5.3 Magnesium

On average for all wells and gates the total magnesium concentration ranged from about 4 to 7 mg/l in groundwater. The decrease in concentration of magnesium across the PRBs has declined from about 35% to 15%.

3.5.4 Manganese

On average for all wells and gates the total manganese concentration ranged from about 2 to 4 mg/l. No trend in concentration is evident across the gates.

3.5.5 Potassium

On average for all wells and gates the potassium concentration ranged from about 1.2 to 2.0 mg/l. No trend in concentration is evident across the gates.

3.5.6 Sodium

On average for all wells and gates the sodium concentration ranged from about 17 to 30 mg/l. There was no significant difference in sodium concentration across the PRBs.

4.0 CONCLUSIONS

Based on the results of the groundwater monitoring, Hercules has concluded the following:

- Groundwater is flowing through the four permeable reactive barriers (PRBs). The flow rate is higher for the surface, sandy layer and less for the deeper, silty layer, as expected. As expected, elevation of the groundwater surface varies seasonally. Redevelopment of wells DG1D and EG4D eliminated the anomalous water levels that had been found previously.
- The PRB Gates E and W are reducing CVOC concentrations in groundwater to below the TCLs for all design CVOCs. The PRB Gates A and D are reducing CVOC concentrations in groundwater to below TCLs for PCE, TCE, and 111TCA. The PRBs reduce the concentrations of 11DCE and 11DCA to below the TCLs in the shallow aquifer, in which most of the groundwater flow occurs. For 11DCE and 11DCA the concentrations in deep downgradient wells at Gates A and D were above the TCLs for these compounds.
- The concentrations of 11DCE and 11DCA in the new wells inside Gates A and D were lower than the downgradient concentrations. The higher downgradient concentration may be due to downgradient desorption of materials from soils or from inadequate flushing of the deep aquifer.
- The inorganic parameter profiles along the well transects reflect expected effects of the iron enhanced process.
- The iron-enhanced PRB groundwater treatment system is effectively removing the groundwater contaminants, as designed.

5.0 RECOMMENDATIONS

Hercules recommends that groundwater monitoring be reduced to a semiannual frequency and to the design CVOCs only.

References

1. Hercules Incorporated, "Report on Construction of Groundwater Treatment System," February 1999.
2. Vermont Department of Environmental Conservation, Letter to Mr. Glen Schmiesing, May 7, 1999.
3. EMCON, Corrective Action Plan," March 5, 1998.
4. Hercules Incorporated, "Groundwater Monitoring Report," June 16, 1999.
5. Envirometals Technology Inc., Letter to Mr. Glen Schmiesing, September 10, 1999.
6. Envirometals Technology Inc., Letter to Mr. Glen Schmiesing, November 15, 2000.

Table I-H Head differences in the transect wells

[redacted]: Head differences in the transect wells, based on the water level measurements in June and September 2000.

Transect wells	June 2000		September 2000	
	In-out head difference (ft)	Hydraulic gradient	In-out head difference (ft)	Hydraulic gradient
Gate A				
AG1D → AG3D	1.69	0.133	1.34	0.106
AG2S → AG4S	1.2	0.095	-	-
AG6D → AG8D	2.16	0.171	1.69	0.133
AG5S → AG7S	2.16	0.171	1.67	0.132
AG9D → AG12D	-1.23	-0.097	1.52	0.120
AG10S → AG11S	1.77	0.140	1.45	0.114
Gate D				
DG1D → DG4D	0.16	0.022	0.35	0.049
DG2S → DG3S	0.38	0.053	0.15	0.021
Gate E				
EG2D → EG4D	-4.1	-0.572	0.31	0.043
EG1S → EB3S	0.75	0.105	0.61	0.085
Gate W				
WG1D → WG4D	1.18	0.165	0.71	0.099
WG2S → WG3S	1.11	0.155	0.65	0.091

TABLE I-CVOC: RESULTS OF ANALYSES OF SAMPLES COLLECTED NOVEMBER 1998

Well	Gate	Loc	Depth	1,1-Dichloro ethene ug/l	1,1-Dichloro ethane ug/l	1,1,1-Tri chloroethane ug/l	Trichloro ethene ug/l	Tetrachloro ethene ug/l
VES				7	70	200	5	5
AG01D	A	I	D	3.4	6.1	89 EJ	1 U	43
AG02S	A	I	S	0.5 U	4.5	4.6	0.5 U	0.93
AG03D	A	O	D	0.5 U	6.9	3.4	0.5 U	0.5 U
AG04S	A	O	S	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
AG05S	A	I	S	38	97	310	10 U	10 U
AG06D	A	I	D	170	340	1,600	50 U	50 U
AG07S	A	O	S	10 U	490	10 U	10 U	10 U
AG08D	A	O	D	20 U	830	20 U	20 U	20 U
AG09D	A	I	D	49	53	440	15 U	15 U
AG10S	A	I	S	1 U	5	44	1 U	1 U
AG11S	A	O	S	0.5 U	13	0.5 U	0.5 U	0.5 U
AG12D	A	O	D	1 U	30.5	1 U	1 U	0.5 U
Removal %				98%	-171%	100%	0%	87%
Ave influent				43.7	84	415	1	8
Ave effluent				1 U	229	1.4 U	1 U	1 U
DG1D	D	I	D	59	80	200 J	120 J	5 U
DG2S	D	I	S	74	49	550 J	10 UJ	10 U
DG3S	D	O	S	20	42	35	1 U	4.3
DG4D	D	O	D	35	63	130	85	5 U
Removal %				59%	19%	78%	29%	-165%
Ave influent				67	65	375	61	1 U
Ave effluent				27.5	52.5	82.5	43	2.7 U
EG1S	E	I	S	7.7 J	15 J	87 J	5 UJ	5 UJ
EG2D	E	I	D	100 UJ	220 J	100 UJ	100 UJ	100 UJ
EG3S	E	O	S	1 UJ	20 J	1 UJ	1 UJ	1 UJ
EG4D	E	O	D	72.5 J	145 J	5.3 UJ	1 UJ	3.8 UJ
Removal %				-745%	30%	98%	0%	0%
Ave influent				4	118	44	1	1 U
Ave effluent				36.8 U	82.5 J	1 UJ	1 UJ	1 UJ
WG1D	West	I	D	0.5 U	0.64	14 J	0.5 UJ	4.6
WG2S	West	I	S	0.5 U	0.5 U	10 J	0.5 UJ	3.8
WG3S	West	O	S	0.5 U	1.1	0.5 UJ	0.5 UJ	0.5 U
WG4D	West	O	D	0.5 U	2.4	0.5 U	0.5 U	0.5 U
Removal %				0%	-113%	92%	0%	76%
Ave influent				1 U	0.8	12 J	1 UJ	4.2
Ave effluent				1 U	1.8	1 U	1 U	1 U
QC								
AG12D	A	O	D	0.5 U	33	0.5 U	0.5 U	0.5 U
AG12D-dup	A	O	D	0.5 U	28	0.5 U	0.5 U	0.5 U
Average				1 U	30.5	1 U	1 U	0.5 U
RPD				0.00%	16.40%	0.00%	0.00%	0.00%
EG4D	E	O	D	61	110	6.6	5 U	5 U
EG4D-dup	E	O	D	84 J	180 J	4 J	2.5 UJ	2.5 UJ
Average				72.5	145	5.3	1 U	3.75 U
RPD				31.70%	48.30%	49.10%	0.00%	66.70%
MW-301	Source			500	1,700	2,600	50 U	120
MW-516	Source			12	120	90	2.5 U	120
MW-001	Fringe			0.5 U	0.5 U	23	0.5 U	15
MW-003	Fringe			0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
MW-010	Fringe			8	12	91	2.5 U	2.5 U
MW-310	Fringe			0.5 U	1 U	4.9	0.5 U	3.7
MW-401S	Fringe			0.5 U	4	1.7	0.5 U	1.6
MW-89-6	Fringe			0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Note: When compound is undetected, as indicated by a U, detection limit is shown, but default value of 1 ug/l is used in calculations.

Severn Trent Laboratories collected and analyzed samples; Environmental Standards, Inc., validated 100% of the data.

TABLE II-CVOC: RESULTS OF ANALYSES OF SAMPLES COLLECTED MARCH 1999

Well VES	Gate	Loc	Depth	1,1-Dichloro ethene ug/l 7	1,1-Dichloro ethane ug/l 70	1,1,1-Tri chloroethane ug/l 200	Trichloro ethene ug/l 5	Tetrachloro ethene ug/l 5
AG01D	A	I	D	0.8 J	1 J	23.5 J	1 UJ	10 J
AG02S	A	I	S	1 UJ	3.6 J	1.1 J	1 UJ	2.4 J
AG03D	A	O	D	1 UJ	4.2 J	1 J	1 UJ	0.5 UJ
AG04S	A	O	S	1 UJ	1 UJ	1 UJ	1 UJ	0.5 UJ
AG05S	A	I	S	8.1 J	13.7 J	137.5 J	1 UJ	2.9 UJ
AG06D	A	I	D	72.5 J	72 J	1,200 J	1 UJ	25 UJ
AG07S	A	O	S	1 UJ	155 J	4.1 UJ	1 UJ	5 UJ
AG08D	A	O	D	25.5 J	745 J	6.5 UJ	1 UJ	17.5 UJ
AG09D	A	I	D	18	22	182.5	1 U	10.85
AG10S	A	I	S	6 J	3.8 J	60 J	1 U	3.8 U
AG11S	A	O	S	1 UJ	35.5 J	1 UJ	1 UJ	0.8 UJ
AG12D	A	O	D	1 UJ	43.5 J	1 UJ	1 UJ	0.8 UJ
Removal %				71%	-748%	100%	0%	77%
Ave influent				17.7 J	19.4 J	267.4 J	1 UJ	4.4 UJ
Ave effluent				5.1 UJ	164 J	1 UJ	1 UJ	1 UJ
DG1D	D	I	D	45.5 J	69 J	120 J	58.5 J	2.5 UJ
DG2S	D	I	S	120 J	66 J	790 J	1 UJ	25 UJ
DG3S	D	O	S	11.4 J	13.5 J	43.5 J	9.5 J	1.5 J
DG4D	D	O	D	24	51	99.65	38	2.5 U
Removal %				79%	52%	84%	20%	-25%
Ave influent				82.8 J	67.5 J	455 J	29.8 UJ	1 UJ
Ave effluent				17.7 J	32.3 J	71.6 J	23.8 J	1.3 UJ
EG1S	E	I	S	50 U	50 U	95	50 U	50 U
EG2D	E	I	D	19	130	20	12 U	12 U
EG3S	E	O	S	5 U	12	5 U	5 U	5 U
EG4D	E	O	D	50 U	66 J	50 U	50 U	50 U
Removal %				90%	40%	98%	0%	0%
Ave influent				10 U	65.5 U	57.5	1 U	1 U
Ave effluent				1 U	39 J	1 U	1 U	1 U
WG1D	West	I	D	0.5 U	1	7.9	0.5 U	0.7
WG2S	West	I	S	0.5 U	1.1	8.4	0.5 U	2
WG3S	West	O	S	0.5 U	2.1	4	0.5 U	0.5 U
WG4D	West	O	D	0.5 U	0.85	0.59	0.5 U	0.5 U
Removal %				0%	-40%	72%	0%	26%
Ave influent				1 U	1.1	8.2	1 U	1.4
Ave effluent				1 U	1.5	2.3	1 U	1 U
QC								
AG09D	A	O	D	18.5 J	31 J	185 J	1 UJ	10.7 J
AG09D-du	A	O	D	18 J	13 J	180	5 U	11
Average				18 J	22 J	182.5 J	1 UJ	10.85 J
RPD				2.80%	81.80%	2.70%	0.00%	2.80%
DG4D	D	O	D	26 J	52 J	99.5 J	38 J	2.5 UJ
DG4D-dup	D	O	D	22.5 J	49 J	99.8 J	38.5 J	2.5 UJ
Average				24 J	51 J	99.65 J	38 J	2.5 UJ
RPD				14.60%	5.90%	0.30%	1.30%	0.00%

TABLE II-CVOC: RESULTS OF ANALYSES OF SAMPLES COLLECTED MARCH 1999

Well VES	Gate	Loc	Depth	1,1-Dichloro ethene ug/l 7	1,1-Dichloro ethane ug/l 70	1,1,1-Tri chloroethane ug/l 200	Trichloro ethene ug/l 5	Tetrachloro ethene ug/l 5
REANALYSES RESULTS COMBINATIONS								
AG01D	A	I	D	0.96 J	0.96	24	0.5 U	10
AG01DRE	A	I	D	0.7 J	1 J	23 J	0.5 UJ	9.9 J
Average				0.8 J	1 J	23.5 J	1 UJ	10 J
RPD				31.30%	4.00%	4.30%	0.00%	1.00%
AG02S	A	I	S	0.5 U	3.1	0.7	0.5 U	2.5
AG02SRE	A	I	S	0.5 UJ	4.1 J	1 J	0.5 UJ	2.3 J
Average				1 UJ	3.6 J	1.1 J	1 UJ	2.4 J
RPD				0.00%	27.80%	63.60%	0.00%	8.30%
AG03D	A	O	D	0.5 U	4.1	1.2	0.5 U	0.5 U
AG03DRE	A	O	D	0.5 UJ	4.3 J	1 J	0.5 UJ	0.5 UJ
Average				1 UJ	4.2 J	1 J	1 UJ	0.5 UJ
RPD				0.00%	4.80%	31.00%	0.00%	0.00%
AG04S	A	O	S	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
AG04SRE	A	O	S	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ
Average				1 UJ	1 UJ	1 UJ	1 UJ	0.5 UJ
RPD				0.00%	0.00%	0.00%	0.00%	0.00%
AG05S	A	I	S	13 J	18	180	2.5 U	3.2
AG05SRE	A	I	S	3.1 J	9.3 J	95 J	2.5 UJ	2.5 UJ
Average				8.1 J	13.7 J	137.5 J	1 UJ	2.9 UJ
RPD				122.20%	63.50%	61.80%	0.00%	75.90%
AG06D	A	I	D	110 J	83	1400	25 U	25 U
AG06DRE	A	I	D	35 J	61 J	1,000.00 J	25 UJ	25 UJ
Average				72.5 J	72 J	1200 J	1 UJ	25 UJ
RPD				103.40%	30.60%	33.30%	0.00%	0.00%
AG07S	A	O	S	5 U	190	7.1	5 U	5 U
AG07SRE	A	O	S	5 UJ	120 J	5 UJ	5 UJ	5 UJ
Average				1 UJ	155 J	4.1 UJ	1 UJ	5 UJ
RPD				0.00%	45.20%	148.80%	0.00%	0.00%
AG08D	A	O	D	34 J	800	25 U	25 U	25 U
AG08DRE	A	O	D	17 J	690 J	12 J	10 UJ	10 UJ
Average				25.5 J	745 J	6.5 UJ	1 UJ	17.5 UJ
RPD				66.70%	14.80%	169.20%	0.00%	0.00%
AG09D	A	I	D	24 J	21 J	190	5 U	8.4
AG09DRE	A	I	D	13 J	41 J	180 J	5 UJ	13 J
Average				18.5 J	31 J	185 J	1 UJ	10.7 J
RPD				59.50%	64.50%	5.40%	0.00%	43.00%
AG10S	A	I	S	5 J	3.9 J	64 J	0.5 U	5.1
AG10SDL	A	I	S	7 J	3.7 J	56	2.5 U	2.5 U
Average				6 J	3.8 J	60 J	1 U	3.8 U
RPD				33.30%	5.30%	13.30%	0.00%	107.90%

TABLE II-CVOC: RESULTS OF ANALYSES OF SAMPLES COLLECTED MARCH 1999

Well VES	Gate	Loc	Depth	1,1-Dichloro ethene ug/l 7	1,1-Dichloro ethane ug/l 70	1,1,1-Tri chloroethane ug/l 200	Trichloro ethene ug/l 5	Tetrachloro ethene ug/l 5
AG11S	A	O	S	0.5 U	22 J	0.5 U	0.5 U	0.5 U
AG11SRE	A	O	S	1 UJ	49 J	1 UJ	1 UJ	1 UJ
Average				1 UJ	35.5 J	1 UJ	1 UJ	0.8 UJ
RPD				0.00%	76.10%	0.00%	0.00%	0.00%
AG12D	A	O	D	0.5 U	32 J	0.5 U	0.5 U	0.5 U
AG12DRE	A	O	D	1 UJ	55 J	1 UJ	1 UJ	1 UJ
Average				1 UJ	43.5 J	1 UJ	1 UJ	0.8 UJ
RPD				0.00%	52.90%	0.00%	0.00%	0.00%
DG1D	D	I	D	62 J	78 J	130	63	2.5 U
DG1DRE	D	I	D	29 J	60 J	110 J	54 J	2.5 UJ
Average				45.5 J	69 J	120 J	58.5 J	2.5 UJ
RPD				72.50%	26.10%	16.70%	15.40%	0.00%
DG2S	D	I	S	170 J	62 J	850	25 U	25 U
DG2SRE	D	I	S	70 J	70 J	730 J	25 UJ	25 UJ
Average				120 J	66 J	790 J	1 UJ	25 UJ
RPD				83.30%	12.10%	15.20%	0.00%	0.00%
DG3S	D	O	S	15 J	15 J	43	9.6	1.6
DG3SRE	D	O	S	7.7 J	12 J	44 J	9.4 J	1.4 J
Average				11.4 J	13.5 J	43.5 J	9.5 J	1.5 J
RPD				64.00%	22.20%	2.30%	2.10%	13.30%
DG4S	D	O	S	34 J	57 J	99	38	2.5 U
DG4SRE	D	O	S	18 J	47 J	100 J	38 J	2.5 UJ
Average				26 J	52 J	99.5 J	38 J	2.5 UJ
RPD				61.50%	19.20%	1.00%	0.00%	0.00%
DG4D-dup	D	O	D	26 J	52 J	99.5 J	38 J	2.5 UJ
DG4D-dup	D	O	D	19 J	46 J	100 J	39 J	2.5 UJ
Average				22.5 J	49 J	99.8 J	38.5 J	2.5 UJ
RPD				31.10%	12.20%	0.50%	2.60%	0.00%
EG1S	E	I	S	50 U	50 U	94	50 U	50 U
EG1SRE	E	I	S	50 UJ	50 UJ	95 J	50 UJ	50 UJ
Average				1 UJ	1 UJ	94.5 J	1 UJ	50 UJ
RPD				0.00%	0.00%	1.10%	0.00%	0.00%
EG2D	E	I	D	49 J	170 J	12 U	12 U	12 U
EG2DRE	E	I	D	19 J	130 J	20 J	12 UJ	12 UJ
Average				34 J	150 J	10.5 J	1 UJ	12 UJ
RPD				88.20%	26.70%	181.00%	0.00%	0.00%
EG3S	E	O	S	5 U	29 J	5 U	5 U	5 U
EG3SRE	E	O	S	5 UJ	12 J	5 UJ	5 UJ	5 UJ
Average				1 UJ	20.5 J	1 UJ	1 UJ	5 UJ
RPD				0.00%	82.90%	0.00%	0.00%	0.00%

TABLE II-CVOC: RESULTS OF ANALYSES OF SAMPLES COLLECTED MARCH 1999

Well VES	Gate	Loc	Depth	1,1-Dichloro ethene ug/l 7	1,1-Dichloro ethane ug/l 70	1,1,1-Tri chloroethane ug/l 200	Trichloro ethene ug/l 5	Tetrachloro ethene ug/l 5
EG4D	E	O	D	50 U	56 J	50 U	50 U	50 U
EG4DRE	E	O	D	50 UJ	66 J	50 UJ	50 UJ	50 UJ
Average				1 UJ	61 J	1 UJ	1 UJ	50 UJ
RPD				0.00%	16.40%	0.00%	0.00%	0.00%
MW-301	Source			360 J	1,600	2,000	50 U	52
MW-516	Source			22 J	330 J	130	1 U	130
MW-001	Fringe			2.3 J	48	27	1 U	3.2
MW-003	Fringe			1 J	1.7 J	0.5 UJ	1 UJ	0.5 UJ
MW-010	Fringe			4.7	10.3	94	3.8 U	2.5 U
MW-310	Fringe			0.5 U	0.5 U	14	0.5 U	4.4
MW-401S	Fringe			0.5 U	8.8	0.7	0.5 U	0.56
MW-89-6	Fringe			1 UJ	1 UJ	0.5 UJ	1 UJ	0.5 UJ
MW-003	Fringe			1.4 J	2 J	0.5 U	0.5 U	0.5 U
MW-003RE	Fringe			0.7 J	1.3 J	1 UJ	0.5 UJ	0.5 UJ
Average				1 J	1.7 J	0.5 UJ	1 UJ	0.5 UJ
RPD				74.00%	41.20%	0.00%	0.00%	0.00%
MW-010	Fringe			4.5 J	11 J	88	4	2.5 U
MW-010RE	Fringe			4.8 J	9.6 J	100 J	3.6 J	2.5 UJ
Average				4.7 J	10.3 J	94 J	3.8 J	2.5 UJ
RPD				6.40%	13.60%	12.80%	10.50%	0.00%
MW-89-6	Fringe			0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
MW-89-6R	Fringe			0.5 UJ	0.5 UJ	1 UJ	0.5 UJ	0.5 UJ
Average				1 UJ	1 UJ	0.5 UJ	1 UJ	0.5 UJ
RPD				0.00%	0.00%	0.00%	0.00%	0.00%
MW-516	Source			22	300 J	140	2.5 U	120
MW-516DL	Source			22 J	360 J	120	5 U	140
Average				22 J	330 J	130	1 U	130
RPD				0.00%	18.20%	15.40%	0.00%	15.40%

Note: When compound is undetected, as indicated by a U, detection limit is shown, but default value of 1 ug/l is used in calculations.

Severn Trent Laboratories collected and analyzed samples. Environmental Standards Inc. validated data.

TABLE III-CVOC: RESULTS OF ANALYSES OF SAMPLES COLLECTED JUNE 1999

Well VES	Gate	Loc	Depth	1,1-Dichloro ethene ug/l 7	1,1-Dichloro ethane ug/l 70	1,1,1-Tri chloroethane ug/l 200	Trichloro ethene ug/l 5	Tetrachloro ethene ug/l 5
AG01D	A	I	D	0.5 U	0.5 U	3	0.5 U	6.4
AG02S	A	I	S	0.5 U	0.75	0.5 U	0.5 U	2.6
AG03D	A	O	D	0.5 U	1.2	1.1	0.5 U	0.5 U
AG04S	A	O	S	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
AG05S	A	I	S	10	17	300	10 U	10 U
AG06D	A	I	D	64	50	1,700	50 U	50 U
AG07S	A	O	S	2.5 U	72	2.5 U	2.5 U	2.5 U
AG08D	A	O	D	1.2	340	13	10 U	10 U
AG09D	A	I	D	19 J	22	250	5 U	5.2
AG10S	A	I	S	3.3 J	6.5	91	3.8	2.5 U
AG11S	A	O	S	0.5 UJ	13	0.5 U	0.5 U	0.5 U
AG12D	A	O	D	0.5 UJ	11	0.5 U	0.5 U	0.5 U
Removal %				94%	-351%	99%	32%	65%
Ave influent				16.4	16	391	1.5 U	2.9
Ave effluent				1 U	73	3 U	1 U	1 U
DG1D	D	I	D	29 J	59	180	5 U	5 U
DG2S	D	I	S	70 J	42	680	12 U	12 U
DG3S	D	O	S	43 J	76	120	2.5 U	5
DG4D	D	O	D	40	59	230	43	5 U
Removal %				16%	-34%	59%	-2100%	-200%
Ave influent				50	51	430	1	1 U
Ave effluent				41.5	67.5	175	22	3 U
EG1S	E	I	S	14 J	20 J	97	2 UJ	2 UJ
EG2D	E	I	D	22 J	110	2.5 U	2.5 U	2.5 U
EG3S	E	O	S	0.5 U	9	0.5 U	0.5 U	0.5 U
EG4D	E	O	D	50 UJ	88 J	50 UJ	50 UJ	50 UJ
Removal %				94%	25%	98%	0%	0%
Ave influent				18	65	49	1 U	1 U
Ave effluent				1 U	48.5 J	1 UJ	1 U	1 UJ
WG1D	West	I	D	0.5 U	0.56	7	0.5 U	0.67
WG2S	West	I	S	0.5 U	0.63	8	0.5 U	1.7
WG3S	West	O	S	0.5 U	1.8	5.3	0.5 U	0.51
WG4D	West	O	D	0.5 U	1.3	2.4	0.5 U	0.5 U
Removal %				0%	-161%	49%	0%	36%
Ave influent				1 U	0.6	8	1 UJ	1.2
Ave effluent				1 U	1.6	3.9	1 U	0.8 U
QC								
AG1DMS	A	I	D	19	21	23	18	24
AG1DMSD	A	I	D	18	21	24	21	25
Average				18.5	21	23.5	19.5	24.5
RPD				5.40%	0.00%	4.30%	15.40%	4.10%
DG4DMS	D	O	D	240	260	420 E	240	210
DG4DMSD	D	O	D	25	27	45 E	24	21
Average				132.5	143.5	232.5 E	132	115.5
RPD				162.30%	162.40%	161.30%	163.60%	163.60%
MW-301	Source			670	2,300	5,400	100 U	130
MW-516	Source			26	440	200	10 U	200
MW-001	Fringe			2	22	36	0.5 U	6.1
MW-003	Fringe			1.3	1.7	0.86	0.5 U	0.5 U
MW-010	Fringe			5.7	16	34	4.1	0.87
MW-310	Fringe			0.51	0.6	13	0.5 U	6
MW-401S	Fringe			0.5 U	1.3	3.8	0.5 U	0.5
MW-89-6	Fringe			0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Note: When compound is undetected, as indicated by a U, detection limit is shown, but default value of 1 ug/l is used in calculations.

Severn Trent Laboratories collected and analyzed samples; Environmental Standards, Inc., validated 100% of the data.

TABLE IV-CVOC: RESULTS OF ANALYSES OF SAMPLES COLLECTED SEPTEMBER 1999

Well VES	Gate	Loc	Depth	1,1-Dichloro ethene ug/l 7	1,1-Dichloro ethane ug/l 70	1,1,1-Tri chloroethane ug/l 200	Trichloro ethene ug/l 5	Tetrachloro ethene ug/l 5
AG01D	A	I	D	0.5 U	0.5 U	2.4	0.5 U	11
AG02S	A	I	S	0.5 U	0.5 U	0.5 U	0.5 U	1.3
AG03D	A	O	D	0.5 U	1.2	0.65	0.5 U	0.5 U
AG04S	A	O	S	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
AG05S	A	I	S	37	63	1,100	25 U	25 U
AG06D	A	I	D	180	100	4,000	100 U	100 U
AG07S	A	O	S	0.5 U	28	0.5 U	0.5 U	0.5 U
AG08D	A	O	D	11	270	5 U	5 U	5 U
AG09D	A	I	D	53	37	570	25 U	25 U
AG10S	A	I	S	32	73	460	10 U	11
AG11S	A	O	S	0.5 U	36	0.5 U	0.5 U	0.5 U
AG12D	A	O	D	0.5 U	19	0.5 U	0.5 U	0.5 U
Removal %				95%	-29%	100%	0%	77%
Ave influent				50.7	46	1,022	1 U	4.4
Ave effluent				2.7 U	59	0.9 U	1 U	1 U
DG1D	D	I	D	90 J	110 J	390 J	180 J	10 UJ
DG2S	D	I	S	200	130	1,300	25 U	25
DG3S	D	O	S	12	17	9.1	1.1	3.5
DG4D	D	O	D	16	130	130	22	5.9
Removal %				90%	39%	92%	87%	64%
Ave influent				145	120	845	91	13 U
Ave effluent				14	73.5	69.6	11.6	4.7 U
EG1S	E	I	S	29	41	99	25 U	25 U
EG2D	E	I	D	32	150	10	5 U	5 U
EG3S	E	O	S	0.5 U	11	0.5 U	0.5 U	0.5 U
EG4D	E	O	D	50 U	50 U	50 U	50 U	50 U
Removal %				97%	94%	98%	0%	0%
Ave influent				31	96	55	1 U	1 U
Ave effluent				1 U	6 J	1 UJ	1 U	1 UJ
WG1D	West	I	D	1.1	6.2	46	1 U	2.4
WG2S	West	I	S	0.82	12	18	1	13
WG3S	West	O	S	0.5 U	12	1.1	0.5 U	0.95
WG4D	West	O	D	0.5 U	7	1.2	0.5 U	0.5 U
Removal %				-4%	-4%	96%	0%	87%
Ave influent				1 U	9.1	32	1 UJ	7.7
Ave effluent				1 U	9.5	1.2	1 U	1 U
MW-301	Source			320	1,800	1,800	50 U	130
MW-516	Source			6.1	100	62	2.5 U	82
MW-001	Fringe			3.3	30	120	2.5 U	4.2
MW-003	Fringe			14	22	1.6	0.5 U	0.5 U
MW-010	Fringe			5.7	16	34	4.1	0.87
MW-310	Fringe			0.5 U	0.5 U	3	0.5 U	2.4
MW-401S	Fringe			0.5 U	0.5 U	0.5	0.5 U	0.5 U
MW-89-6	Fringe			0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Note: When compound is undetected, as indicated by a U, detection limit is shown, but default value of 1 ug/l is used in calculations. .

Severn Trent Laboratories collected and analyzed samples; Environmental Standards, Inc., validated 100% of the data.

TABLE V-CVOC: RESULTS OF ANALYSES OF SAMPLES COLLECTED DECEMBER 1999

Well VES	Gate	Loc	Depth	1,1-Dichloro ethene ug/l 7	1,1-Dichloro ethane ug/l 70	1,1,1-Tri chloroethane ug/l 200	Trichloro ethene ug/l 5	Tetrachloro ethene ug/l 5
AG01D	A	I	D	0.5 U	1.8	14	0.5 U	9.5
AG02S	A	I	S	0.5 U	3.1	1.8	0.5 U	0.5 U
AG03D	A	O	D	0.5 U	2.4	0.76	0.5 U	0.5 U
AG04S	A	O	S					
AG05S	A	I	S	12	10 U	420	10 U	10 U
AG06D	A	I	D	120	140 X	3,600	100 U	100 U
AG07S	A	O	S	5 U	20	9 U	5 U	5 U
AG08D	A	O	D	10	130	2.5 U	2.5 U	2.5 U
AG09D	A	I	D	49	85	1,200	25 U	25 U
AG10S	A	I	S	5 U	8.7	270	5 U	5 U
AG11S	A	O	S	0.5 U	15	0.5 U	0.5 U	0.5 U
AG12D	A	O	D	1 U	33	1 U	1 U	1 U
Removal %				92%	16%	100%	17%	66%
Ave influent				30.7	40	918	1 U	2.4
Ave effluent				2.3	33	0.8	0.8 U	0.8
DG1D	D	I	D	48	73	130	96	5 U
DG2S	D	I	S	180	98	1,300	25 U	25 U
DG3S	D	O	S	64	70	230	5 U	5 U
DG4D	D	O	D	70	85	280	5 U	5 U
Removal %				41%	9%	64%	98%	0%
Ave influent				114	86	715	49	1
Ave effluent				67	77.5	255	1	1
EG1S	E	I	S	100 U	100 U	120 X	100 U	100 U
EG2D	E	I	D	38	140	64	10 U	10 U
EG3S	E	O	S	1 U	15	1 U	1 U	1 U
EG4D	E	O	D	10 X	47 U	10 U	10 U	10 U
Removal %				72%	89%	99%	0%	0%
Ave influent				20	71	92	1	1
Ave effluent				5.5	8	1	1	1
WG1D	West	I	D	5 U	32	280	5 U	100
WG2S	West	I	S	12 U	54	530	12 U	210
WG3S	West	O	S	2.5 U	170	32	2.5 U	40
WG4D	West	O	D	2.5 U	65	7	2.5 U	5.3
Removal %				0%	-173%	95%	0%	85%
Ave influent				1	43	405	1	155
Ave effluent				1	117.5	19.5	1	22.7
MW-301	Source			300	1,600	1,900	50 U	95 X
MW-516	Source			8.4 X	160	32	5 U	83
MW-001	Fringe			1 U	1 U	3.5	1 U	1.7 X
MW-003	Fringe			8	11	0.87 X	0.5 U	0.5 U
MW-010	Fringe							
MW-310	Fringe			0.5 U	0.5 U	5.9	0.5 U	2.3
MW-401S	Fringe			0.5 U	0.5 U	0.9	0.5 U	0.5 U
MW-89-6	Fringe			0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Note: When compound is undetected, as indicated by a U, detection limit is shown, but default value of 1 ug/l is used in calculations.

Severn Trent Laboratories collected and analyzed samples.

TABLE VI-CVOC: RESULTS OF ANALYSES OF SAMPLES COLLECTED MARCH 2000

Well VES	Gate	Loc	Depth	1,1-Dichloro ethene ug/l 7	1,1-Dichloro ethane ug/l 70	1,1,1-Tri chloroethane ug/l 200	Trichloro ethene ug/l 5	Tetrachloro ethene ug/l 5
AG01D	A	I	D	1 U	1.3 X	33 D	1 U	13 D
AG02S	A	I	S	0.5 U	1.2	0.5 U	0.5 U	1.2 X
AG03D	A	O	D	0.5 U	18	0.5 U	0.5 U	0.5 U
AG04S	A	O	S	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
AG05S	A	I	S	5 U	5 U	190 D	5 U	5 U
AG06D	A	I	D	140 D	78 D	2,700 D	50 U	50 U
AG07S	A	O	S	1 U	39 D	1 U	1 U	1 U
AG08D	A	O	D	11 D	200 D	5 U	5 U	5 U
AG09D	A	I	D	110 D	200 D	1,200 D	25 U	25 U
AG10S	A	I	S	7.6 D	23 D	140 D	2.5 U	2.5 U
AG11S	A	O	S	2.5 U	120 D	2.5 U	2.5 U	2.5 U
AG12D	A	O	D	2.5 U	130 D	2.5 U	2.5 U	2.5 U
Removal %				94%	-67%	100%	0%	67%
Ave influent				43.4	51	711	1 U	3
Ave effluent				2.7	85	1	1 U	1
DG1D	D	I	D	77 D	93 D	250 D	190 D	5 U
DG2S	D	I	S	250 U	250 U	12,000 D	250 U	250 U
DG3S	D	O	S	130 D	140 D	1,200 D	25 U	25 U
DG4D	D	O	D	60 D	82 D	420 D	10 U	10 U
Removal %				-144%	-136%	87%	99%	0%
Ave influent				39	47	6,125	96	1
Ave effluent				95	111	810	1	1
EG1S	E	I	S	50 U	50 U	50 U	50 U	50 U
EG2D	E	I	D	30 D	120 D	24 D	12 U	12 U
EG3S	E	O	S	5 U	18 D	5 U	5 U	5 U
EG4D	E	O	D	25 U	25 U	25 U	25 U	25 U
Removal %				94%	84%	92%	0%	0%
Ave influent				16	61	13	1	1
Ave effluent				1	9.5	1	1	1
WG1D	West	I	D	0.69	1.7	26	0.5 U	13
WG2S	West	I	S	0.5 U	2.5	23	0.5 U	9.8
WG3S	West	O	S	0.5 U	21	25	0.5 U	12
WG4D	West	O	D	0.72	21	20	0.5 U	9.9
Removal %				-2%	-900%	8%	0%	4%
Ave influent				0.8	2.1	25	1	11.4
Ave effluent				0.9	21	22.5	1	11
MW-301	Source			250 D	1,300 D	2,100 D	50 U	76 X
MW-516	Source			8.7 D	140 D	51 D	2.5 U	72 D
MW-001	Fringe			0.5 U	0.54	7	0.5 U	1.1
MW-003	Fringe			0.5 U	0.52	0.5 U	0.5 U	0.5 U
MW-010	Fringe			0.5 U	1	8.3	0.5 U	0.5 U
MW-310	Fringe			5 U	5.3 D	200 D	5 U	22 D
MW-401S	Fringe			0.5 U	11	8.4	0.5 U	12
MW-89-6	Fringe			0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Note: When compound is undetected, as indicated by a U, detection limit is shown, but default value of 1 ug/l is used in calculations. .

Severn Trent Laboratories collected and analyzed samples.

TABLE VII-CVOC: RESULTS OF ANALYSES OF SAMPLES COLLECTED JUNE 2000

Well VES	Gate	Loc	Depth	1,1-Dichloro ethene ug/l 7	1,1-Dichloro ethane ug/l 70	1,1,1-Tri chloroethane ug/l 200	Trichloro ethene ug/l 5	Tetrachloro ethene ug/l 5
AG01D	A	I	D	0.5 U	0.5 U	5.7	0.5 U	12
AG02S	A	I	S	0.5 U	0.5 U	0.5 U	0.5 U	2.1
AG03D	A	O	D	0.5 U	3.4	0.5 U	0.5 U	0.5 U
AG04S	A	O	S	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
AG05S	A	I	S	23 D	18 D	550 D	10 U	13 D
AG06D	A	I	D	150 D	100 D	3900 D	100 U	100 U
AG07S	A	O	S	15 D	600 D	39 D	10 U	10 U
AG08D	A	O	D	21 D	690 D	10 U	10 U	10 U
AG09D	A	I	D	25	47	270	5 U	8.5
AG10S	A	I	S	1.3	2.8	9.3	0.5 U	0.86
AG11S	A	O	S	0.5 U	24	0.5 U	0.5 U	0.5 U
AG12D	A	O	D	0.5 U	16	0.5 U	0.5 U	0.5 U
AG13D				3.5	160	5.2 X	2.5 U	2.5 U
Removal %				81%	-654%	99%	0.0%	84%
Ave influent				34	28	789	1.0	6.2
Ave effluent				6.2	213	7.0	1.0	1.0
DG1D	D	I	D	58 D	71 D	320 D	130 D	10 U
DG2S	D	I	S	36	21	240	5 U	11 X
DG3S	D	O	S	12	28	68	2.5 U	6.8
DG4D	D	O	D	76 D	91 D	630 D	25 U	25 U
DG5D				1.4	35	1 U	1 U	1 U
DG6S				3.1	24	0.5 U	0.5 U	0.5 U
Removal %				51%	3%	38%	98%	59%
Ave influent				47	46	280	65.5	6
Ave effluent				23	45	175	1	2
EG1S	E	I	S	15	30	100	2.5 U	2.5 U
EG2D	E	I	D	89	230	11	5 U	5 U
EG3S	E	O	S	5.4 X	30	5 U	5 U	5 U
EG4D	E	O	D	6.8 X	48	5 U	5 U	5 U
Removal %				88%	70%	98%	0%	0%
Ave influent				52	130	55.5	1	1
Ave effluent				6.1	39	1	1	1
WG1D	West	I	D	0.5 U	0.5 U	7.8	0.5 U	4.6
WG2S	West	I	S	0.5 U	1.8	5.4	0.5 U	3.6
WG3S	West	O	S	0.5 U	3.7	0.5 U	0.5 U	1.5
WG4D	West	O	D	0.5 U	6.9	1.9	0.5 U	2.4
Removal %				0%	-279%	78%	0%	52%
Ave influent				1	1.4	6.6	1	4.1
Ave effluent				1	5.3	1.45	1	1.95
MW-301	Source			330 D	1,600 D	2,800 D	50 U	110 DX
MW-516	Source			13 D	260 D	140 D	5 U	270 D
MW-001	Fringe			1.2	2	11	0.5 U	3.1
MW-003	Fringe			1.2	1.8	0.5 U	0.5 U	0.5 U
MW-010	Fringe			100 D	160 D	720 D	12 U	12 U
MW-310	Fringe			1 U	1 U	39	1 U	11
MW-401S	Fringe			0.5 U	1.6	1.5	0.5 U	1.6
MW-89-6	Fringe			0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

TABLE VIII-CVOC: RESULTS OF ANALYSES OF SAMPLES COLLECTED SEPTEMBER 2000

Well	Gate	Loc	Depth	1,1-Dichloro ethene ug/l	1,1-Dichloro ethane ug/l	1,1,1-Tri chloroethane ug/l	Trichloro ethene ug/l	Tetrachloro ethene ug/l
VES				7	70	200	5	5
AG01D	A	I	D	0.65	0.5 U	4.8	0.5 U	15
AG02S	A	I	S	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
AG03D	A	O	D	0.5 U	1.5	0.5 U	0.5 U	0.5 U
AG04S	A	O	S					
AG05S	A	I	S	24 D	6.1 D	510 DE	5 U	11 D
AG06D	A	I	D	300 D	180 D	3,000 DE	5 U	51 D
AG07S	A	O	S	4.4 DJ	19 D	52 D	5 U	5 U
AG08D	A	O	D	7.9	330	5.0 U	5 U	5 U
AG09D	A	I	D	98 D	180 D	900 DE	5 U	36 D
AG10S	A	I	S	21	93	200	5 U	5 U
AG11S	A	O	S	0.5 U	24	0.5 U	0.5 U	0.5 U
AG12D	A	O	D	0.5 U	17	0.5 U	0.5 U	0.5 U
AG13D	A	O	D	14	190	31	5 U	5 U
Removal %				94%	-8%	98%	14%	96%
Ave influent				74	77	769	1	19
Ave effluent				4.2	83.1	12.4	0.9	0.9
DG1D	D	I	D	91 D	140 D	440 DE	110 D	5 U
DG2S	D	I	S	170 D	110 D	1,000 DE	5 U	22 D
DG3S	D	O	S	21	45	27	1 U	6.7
DG4D	D	O	D	120 D	170 D	780 DE	13 D	9.3 D
DG5D	D	O	D	0.72	16	0.5 U	0.5 U	0.5 U
DG6S	D	O	S	2.7	39	0.5 U	0.5 U	0.5 U
Removal %				72%	14%	44%	87%	30%
Ave influent				131	125	720	56	12
Ave effluent				36	108	404	7	8
EG1S	E	I	S	8.0	16	52	2.5 U	2.5 U
EG2D	E	I	D	30	160 P	5 U	5 U	5 U
EG3S	E	O	S	5.0 U	7.6 P	5 U	5 U	5 U
EG4D	E	O	D	3.8 D	53 D	1 U	1 U	1 U
Removal %				87%	66%	96%	0%	0%
Ave influent				19.0	88.0	26.5	1.0	1.0
Ave effluent				2.4	30.3	1.0	1.0	1.0
WG1D	West	I	D	0.93	3.7	9.7	0.5 U	9.2
WG2S	West	I	S	1.0	1.1	10	0.5 U	5.4
WG3S	West	O	S	0.83	5.3	1.6	0.5 U	0.5 U
WG4D	West	O	D	0.5 U	10	0.81	0.5 U	0.92
Removal %				5%	-219%	88%	0%	87%
Ave influent				1.0	2.4	9.9	1.0	7.3
Ave effluent				0.9	7.7	1.2	1.0	1.0
MW-301	Source			250 D	1,200 DE	1,100 DEP	5 U	71 DP
MW-516	Source			4.1 JP	60 P	88	5 U	100
MW-001	Fringe			0.54	1.6	6.6 P	0.5 U	1.4 P
MW-003	Fringe			3.3 P	11	0.5 U	0.5 U	0.5 U
MW-010	Fringe							
MW-310	Fringe			2.5 U	2.5 U	62 P	2.5 U	7.7 P
MW-401S	Fringe			0.5 U	0.12 JP	1.1 P	0.5 U	0.5 U
MW-89-6	Fringe			0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Note: When compound is undetected, as indicated by a U, detection limit is shown, but default value of 1 ug/l is used in calculations.

Severn Trent Laboratories collected and analyzed samples.

TABLE I-MIN: RESULTS OF ANALYSES OF SAMPLES COLLECTED NOVEMBER 1998

Well	Gate	Loc	Depth	Type	Calcium ug/l	Iron ug/l	Magnesium ug/l	Manganese ug/l	Potasium ug/l	Sodium ug/l
AG01D	A	I	D	Filtered	17,100	868	4,980 B	780	1,690 B	25,400
AG02S	A	I	S	Filtered	16,700	3,200	4,870 B	6,380	845 B	17,400
AG03D	A	O	D	Filtered	19,400	46 U	4,740 B	5,210	1,370 B	22,600
AG04S	A	O	S	Filtered	21,400	1,400	4,850 B	12,000	1,000 B	15,000
AG05S	A	I	S	Filtered	17,500	424 J	3,230 B	4,830	885 B	13,800
AG06D	A	I	D	Filtered	15,800	55 B	3,900 B	286	1,520 B	33,400
AG07S	A	O	S	Filtered	12,800	104 J	1,520 B	38 U	1,480 B	17,300
AG08D	A	O	D	Filtered	15,300	71 BJ	2,400 B	1,180	2,070 B	19,800
AG09D	A	I	D	Filtered	8,360	98 BJ	1,730 B	526	472 B	3,500 B
AG10S	A	I	S	Filtered	20,200	280 J	3,370 B	1,170	1,320 B	12,600
AG11S	A	O	S	Filtered	13,000	320 J	1,970 B	204	1,080 B	8,760
AG12D	A	O	D	Filtered	14,100	134 J	1,450 B	605	955 B	5,240
Removal %					15,972	580	3,251	2,764	1,224	16,233
Influent					15,943	821 J	3,680 B	2,329	1,122 B	17,683
Effluent					16,000	338 J	2,822 B	3,200	1,326 B	14,783
DG1D	D	I	D	Filtered	49,800	39 U	9,960	4,620	2,360 B	15,400
DG2S	D	I	S	Filtered	18,200	39 U	3,230 B	6,410	1,060 B	7,250
DG3S	D	O	S	Filtered	13,200	85 BJ	2,390 B	2,110	1,120 B	7,900
DG4D	D	O	D	Filtered	20,600	39 U	4,090 B	10,800	1,480 B	11,100
Removal %					25,450	22	4,918	5,985	1,505	10,413
Influent					34,000	1	6,595 B	5,515	1,710 B	11,325
Effluent					16,900	43	3,240 B	6,455	1,300 B	9,500
EG1S	E	I	S	Filtered	23,100	40 BJ	6,740	5,680	2,490 B	11,500
EG2D	E	I	D	Filtered	50,500	39 U	11,700	1,150	2,210 B	23,700
EG3S	E	O	S	Filtered	14,400	78 BJ	3,520 B	6,550	851 B	6,020
EG4D	E	O	D	Filtered	47,200	1 U	9,500	368	1,600 B	15,300
Removal %					33,800	30	7,865	3,437	1,788	14,130
Influent					36,800	21	9,220 B	3,415	2,350 B	17,600
Effluent					30,800	39	6,510 B	3,459	1,226 B	10,660
WG1D	W	I	D	Filtered	17,200	67 BJ	3,520 B	594	1,040 B	21,700
WG2S	W	I	S	Filtered	22,600	39 U	4,490 B	744	1,110 B	20,200
WG3S	W	O	S	Filtered	14,300	39 U	2,020 B	1,060	994 B	21,800
WG4D	W	O	D	Filtered	22,400	46 U	3,910 B	839	1,470 B	41,600
Removal %					19,125	18	3,485	809	1,154	26,325
Influent					19,900	34	4,005 B	669	1,075 B	20,950
Effluent					18,350	1	2,965 B	950	1,232 B	31,700
QC										
AG12D				Filtered	13,700	125 J	1,410 B	614	922 B	5,160
AG12D-dup				Filtered	14,500	142 J	1,490 B	595	988 B	5,320
Average					14,100	134	1,450	605	955	5,240
RPD					5.70%	12.70%	5.50%	3.10%	6.90%	3.10%
EG4D				Filtered	46,600	39 U	9,390	366	1,450 B	15,200
EG4D-dup				Filtered	47,800	39 U	9,610	370	1,750 B	15,400
Average					47,200	1	9,500	368	1,600	15,300
RPD					2.50%	0.00%	2.30%	1.10%	18.80%	1.30%

Note: When compound is undetected, as indicated by a U, detection limit is shown, but default value of 1 ug/l is used in calculations.

TABLE II-MIN: RESULTS OF ANALYSES OF SAMPLES COLLECTED MARCH 1999

Well	Gate	Loc	Depth	Type	Calcium ug/l	Iron ug/l	Magnesium ug/l	Manganese ug/l	Potasium ug/l	Sodium ug/l
AG01D	A	I	D	Filtered	11,900	17 U	3,670	134	1,010	23,500
AG02S	A	I	S	Filtered	12,900	7,500	4,400	6,420	616	14,500
AG03D	A	O	D	Filtered	10,800	17 U	2,460	4,870	668	20,000
AG04S	A	O	S	Filtered	25,100	2,310	5,620	9,410	672	9,550
AG05S	A	I	S	Filtered	13,000	1,000 U	2,490	3,730	1,180	23,600
AG06D	A	I	D	Filtered	15,600	17 U	3,930	239	991	35,100
AG07S	A	O	S	Filtered	8,990	17 U	1,720	23	1,030	17,300
AG08D	A	O	D	Filtered	13,100	17 U	2,350	609	1,260	19,300
AG09D	A	I	D	Filtered	6,520	1 U	1,470	317	1 U	3,200
AG10S	A	I	S	Filtered	12,900	17 U	1,800	598	556	4,520
AG11S	A	O	S	Filtered	7,560	17 U	871	38	547	3,940
AG12D	A	O	D	Filtered	7,000	151 U	841	198	355 U	6,640
Average					12,114	818	2,635	2,215	711	15,096
Influent					12,137	1,251	2,960	1,906	726	17,403
Effluent					12,092	386	2,310	2,525	696	12,788
DG1D	D	I	D	Filtered	40,800	17 U	8,260	2,800	1,510	7,290
DG2S	D	I	S	Filtered	17,300	71 U	2,970	2,990	361	4,610
DG3S	D	O	S	Filtered	13,600	2,380	2,480	1,410	603	8,330
DG4D	D	O	D	Filtered	25,200 J	1 U	5,235 J	4,625 J	1,380	8,450
Average					24,225	596	4,736	2,956	964	7,170
Influent					29,050	1	5,615	2,895	936	5,950
Effluent					19,400	1,191	3,858 J	3,018 J	992	8,390
EG1S	E	I	S	Filtered	29,200	227 U	8,420	8,190	2,000	11,600
EG2D	E	I	D	Filtered	46,800	17 U	11,000	1,800	2,190	11,000
EG3S	E	O	S	Filtered	17,100	17 U	6,430	1,870	1,520	7,130
EG4D	E	O	D	Filtered	3,140	17 U	6,010	208	1,210	14,800
Average					24,060	1	7,965	3,017	1,730	11,133
Influent					38,000	1	9,710	4,995	2,095	11,300
Effluent					10,120	1	6,220	1,039	1,365	10,965
WG1D	W	I	D	Filtered	35,600	189 U	8,580	249	2,190	65,000
WG2S	W	I	S	Filtered	34,100	219 U	6,690	3,070	1,160	24,700
WG3S	W	O	S	Filtered	22,700	371 U	3,170	4,700	7,760	44,900
WG4D	W	O	D	Filtered	22,500	559 U	5,320	266	1,590	45,100
Average					28,725	1	5,940	2,071	3,175	44,925
Influent					34,850	1	7,635	1,660	1,675	44,850
Effluent					22,600	1	4,245	2,483	4,675	45,000
QC										
AG09D				Filtered	6,350	17.1 U	1,420	320	355 U	3,080
AG09D-dup				Filtered	6,690	17 U	1,520	314	355 U	3,320
Average					6,520	1	1,470	317	1	3,200
RPD					5.20%	0.00%	6.80%	1.90%	0.00%	7.50%
DG4D				Filtered	22,000 J	18 U	4,670 J	5,770 J	1,320	8,870
DG4D-dup				Filtered	28,400 J	17 U	5,800 J	3,480 J	1,440	8,030
Average					25,200	1	5,235	4,625	1,380	8,450
RPD					25.40%	0.00%	21.60%	49.50%	8.70%	9.90%

Note: When compound is undetected, as indicated by a U, detection limit is shown, but default value of 1 ug/l is used in calculations.

TABLE III-MIN: RESULTS OF ANALYSES OF SAMPLES COLLECTED JUNE 1999

Well	Gate	Loc	Depth	Type	Calcium ug/l	Iron ug/l	Magnesium ug/l	Manganese ug/l	Potasium ug/l	Sodium ug/l
AG01D	A	I	D	Filtered	11,100	422	3,500	214	1,090	20,600
AG02S	A	I	S	Filtered	9,130	12,200	2,610	2,150	816	15,800
AG03D	A	O	D	Filtered	11,200	194 J	2,290	5,760	650	20,300
AG04S	A	O	S	Filtered	13,000	6,940	2,140	12,200	1,700	24,700
AG05S	A	I	S	Filtered	14,800	74 J	2,590	1,400	1,480	31,000
AG06D	A	I	D	Filtered	15,200	17 U	3,670	203	2,050	32,100
AG07S	A	O	S	Filtered	9,610	28 J	2,130	294	1,160	18,500
AG08D	A	O	D	Filtered	10,800	17 U	1,630	603	1,470	23,200
AG09D	A	I	D	Filtered	9,090	116 J	1,970	418	360	3,940
AG10S	A	I	S	Filtered	13,900	85 U	1,860	866	898	5,890
AG11S	A	O	S	Filtered	7,430	376	847	32	865	5,880
AG12D	A	O	D	Filtered	6,470	140 J	887	63	458	7,740
Average					10,978	1,708	2,177	2,017	1,083	17,471
Influent					12,203	2,136	2,700	875	1,116	18,222
Effluent					9,752	1,280	1,654	3,159	1,051 U	16,720
DG1D	D	I	D	Filtered	40,900	17 U	8,580	2,430	1,340	5,830
DG2S	D	I	S	Filtered	16,400	69 U	2,780	2,340	482	3,500
DG3S	D	O	S	Filtered	19,100	17 U	3,540	2,040	440	4,530
DG4D	D	O	D	Filtered	19,600	17 U	4,090	4,680	1,340	9,000
Average					24,000	1	4,748	2,873	901	5,715
Influent					28,650	1	5,680	2,385	911	4,665
Effluent					19,350	1	3,815	3,360	890	6,765
EG1S	E	I	S	Filtered	24,900	392	7,010	7,880	2,520	11,600
EG2D	E	I	D	Filtered	47,500	17 U	11,100	1,620	2,550	13,200
EG3S	E	O	S	Filtered	19,700	17 U	6,880	1,470	2,240	7,990
EG4D	E	O	D	Filtered	32,000	57 U	5,780	252	933	13,300
Average					31,025	99	7,693	2,806	2,061	11,523
Influent					36,200	197	9,055	4,750	2,535	12,400
Effluent					25,850	1	6,330	861	1,587	10,645
WG1D	W	I	D	Filtered	37,000	17 U	8,320	1,200	1,890	88,100
WG2S	W	I	S	Filtered	29,700	292 J	7,220	1,160	1,820	75,600
WG3S	W	O	S	Filtered	30,300	17 U	6,120	1,650	1,890	59,800
WG4D	W	O	D	Filtered	23,000	17 U	5,930	1,400	1,910	66,800
Average					30,000	74	6,898	1,403	1,878	72,575
Influent					33,350	147	7,770	1,180	1,855	81,850
Effluent					26,650	1	6,025	1,625	1,900	63,300

Note: When compound is undetected, as indicated by a U, detection limit is shown, but default value of 1 ug/l is used in calculations.

TABLE IV-MIN: RESULTS OF ANALYSES OF SAMPLES COLLECTED SEPTEMBER 1999

Well	Gate	Loc	Depth	Type	Calcium ug/l	Iron ug/l	Magnesium ug/l	Manganese ug/l	Potasium ug/l	Sodium ug/l
AG01D	A	I	D	Filtered	14,700	1,120	4,630	225	1,250	22,900
AG02S	A	I	S	Filtered	20,800	22,000	6,640	1,890	1,120	29,400
AG03D	A	O	D	Filtered	12,200	676	2,130	3,360	581	19,800
AG04S	A	O	S	Filtered						
AG05S	A	I	S	Filtered	15,000	287 J	2,990	1,840	1,600	38,100
AG06D	A	I	D	Filtered	18,800	15 U	4,760	316	2,410	35,500
AG07S	A	O	S	Filtered	20,600	1,630	3,030	3,340	1,410	20,800
AG08D	A	O	D	Filtered	21,400	15 U	3,280	549	1,590	22,800
AG09D	A	I	D	Filtered	11,200	280 J	2,460	387	1,500	4,800
AG10S	A	I	S	Filtered	19,700	15 U	3,350	1,390	1,710	12,100
AG11S	A	O	S	Filtered	7,580	15 U	606	6 U	856	12,000
AG12D	A	O	D	Filtered	9,150	15 U	975	70	580	11,100
Average					15,557	2,167	3,168	1,114	1,328	20,845
Influent					16,700	3,948	4,138	1,008	1,598	23,800
Effluent					14,186	385	2,004	1,220	1,003	17,300
DG1D	D	I	D	Filtered	38,600	15 U	8,830	4,540	1,870	10,700
DG2S	D	I	S	Filtered	21,500	457	3,740	2,460	555	5,190
DG3S	D	O	S	Filtered	13,900	15 U	2,790	2,520	393	6,070
DG4D	D	O	D	Filtered	21,100	15 U	3,970	2,520	1,610	6,930
Average					23,775	115	4,833	3,010	1,107	7,223
Influent					30,050	229	6,285	3,500	1,213	7,945
Effluent					17,500	1	3,380	2,520	1,002	6,500
EG1S	E	I	S	Filtered	26,300	959	6,740	7,200	2,410	11,300
EG2D	E	I	D	Filtered	45,500	15 U	10,600	1,440	2,110	11,900
EG3S	E	O	S	Filtered	16,600	16 U	5,520	1,270	2,730	9,030
EG4D	E	O	D	Filtered	33,700	15 U	5,540	275	1,210	15,800
Average					30,525	241	7,100	2,546	2,115	12,008
Influent					35,900	480	8,670	4,320	2,260	11,600
Effluent					25,150	1	5,530	773	1,970	12,415
WG1D	W	I	D	Filtered	40,300	15 U	9,180	898	2,240	93,400
WG2S	W	I	S	Filtered	31,100	2,130	8,400	13,400	1,220	50,000
WG3S	W	O	S	Filtered	53,000	7,790	13,800	14,600	2,620	71,200
WG4D	W	O	D	Filtered	37,700	59 J	10,700	5,050	2,560	88,600
Average					40,525	2,495	10,520	8,487	2,160	75,800
Influent					35,700	1,066	8,790	7,149	1,730	71,700
Effluent					45,350	3,924	12,250	9,825	2,590	79,900

Note: When compound is undetected, as indicated by a U, detection limit is shown, but default value of 1 ug/l is used in calculations.

TABLE V-MIN: RESULTS OF ANALYSES OF SAMPLES COLLECTED DECEMBER 1999

Well	Gate	Loc	Depth	Type	Calcium ug/l	Iron ug/l	Magnesium ug/l	Manganese ug/l	Potasium ug/l	Sodium ug/l
AG01D	A	I	D	Filtered	22,500	418	6,920	506	1,730 B	46,300
AG02S	A	I	S	Filtered	15,400	15,800	5,210	1,840	1,220 B	34,000
AG03D	A	O	D	Filtered	20,500	1,300	2,800 B	4,030	830 B	27,400
AG04S	A	O	S	Filtered						
AG05S	A	I	S	Filtered	9,540	146	2,060 B	929	1,270 B	21,800
AG06D	A	I	D	Filtered	19,400	65 B	4,310 B	267	1,950 B	32,400
AG07S	A	O	S	Filtered	9,660	482	1,250 B	322	909 B	13,400
AG08D	A	O	D	Filtered	11,500	259	1,700 B	327	1,350 B	18,200
AG09D	A	I	D	Filtered	18,800	266	4,020 B	502	996 B	12,700
AG10S	A	I	S	Filtered	13,100	275	2,090 B	1,880	1,150 B	7,980
AG11S	A	O	S	Filtered	12,700	59 B	1,240 B	35	931 B	6,890
AG12D	A	O	D	Filtered	8,390	114	422 B	19	845 B	11,400
Average					14,681	1,599	2,911	888	1,198	21,134
Influent					16,457	2,828	4,102	987	1,386	25,863
Effluent					12,550	369	1,482	789	973	15,458
DG1D	D	I	D	Filtered	40,100	75 B	8,750	3,680	2,430 B	7,060
DG2S	D	I	S	Filtered	21,300	178	3,670 B	1,970	749 B	6,490
DG3S	D	O	S	Filtered	13,100	792	2,860 B	4,150	753 B	6,170
DG4D	D	O	D	Filtered	26,000	26 B	4,940 B	4,120	1,900 B	7,190
Average					25,125	268	5,055	3,480	1,458	6,728
Influent					30,700	127	6,210	2,825	1,590	6,775
Effluent					19,550	409	3,900	4,135	1,327	6,680
EG1S	E	I	S	Filtered	27,400	1,140	7,810	7,130	2,360 B	11,500
EG2D	E	I	D	Filtered	54,600	106	12,900	876	2,010 B	20,700
EG3S	E	O	S	Filtered	21,400	324	8,560	2,370	3,090 B	9,040
EG4D	E	O	D	Filtered	30,700	50 B	4,840 B	216	1,260 B	14,200
Average					33,525	405	8,528	2,648	2,180	13,860
Influent					41,000	623	10,355	4,003	2,185	16,100
Effluent					26,050	187	6,700	1,293	2,175	11,620
WG1D	W	I	D	Filtered	38,400	237	8,690	586	6,890	88,200
WG2S	W	I	S	Filtered	33,100	64 B	8,290	1,970	2,040 B	70,100
WG3S	W	O	S	Filtered	25,100	4,860	5,760	4,730	1,380 B	56,800
WG4D	W	O	D	Filtered	27,700	130	7,410	2,880	1,580 B	65,600
Average					31,075	1,323	7,538	2,542	2,973	70,175
Influent					35,750	150	8,490	1,278	4,465	79,150
Effluent					26,400	2,495	6,585	3,805	1,480	61,200

Note: When compound is undetected, as indicated by a U, detection limit is shown, but default value of 1 ug/l is used in calculations.

TABLE VI-MIN: RESULTS OF ANALYSES OF SAMPLES COLLECTED MARCH 2000

Well	Gate	Loc	Depth	Type	Calcium ug/l	Iron ug/l	Magnesium ug/l	Manganese ug/l	Potasium ug/l	Sodium ug/l
AG01D	A	I	D	Filtered	19,800	46 U	6,490	363	1,600 B	65,300
AG02S	A	I	S	Filtered	15,200	7,990	5,680	3,060	1,110 B	33,900
AG03D	A	O	D	Filtered	21,600	824	4,420 B	3,120	930 B	50,300
AG04S	A	O	S	Filtered	36,900	15,500	9,100	11,200	5,030	18,600
AG05S	A	I	S	Filtered	7,320	52 B	1,720 B	521	1,060 B	15,500
AG06D	A	I	D	Filtered	16,200	136	3,380 B	207	1,330 B	21,400
AG07S	A	O	S	Filtered	4,170 B	75 B	467 B	7 B	629 B	10,200
AG08D	A	O	D	Filtered	6,650	124	790 B	94	1,030 B	15,400
AG09D	A	I	D	Filtered	15,300	134	3,670 B	464	400 B	15,000
AG10S	A	I	S	Filtered	16,600	2,700	2,940 B	9,130	2,820 B	19,200
AG11S	A	O	S	Filtered	9,000	152	928 B	67	911 B	8,390
AG12D	A	O	D	Filtered	6,660	116	419 B	11 B	492 B	8,090
Average					14,617	2,317	3,334	2,354	1,445	23,440
Influent					15,070	1,835	3,980	2,291	1,387	28,383
Effluent					14,163	2,798	2,687	2,417	1,504	18,497
DG1D	D	I	D	Filtered	34,000	82 B	8,310	4,120	1,950 B	10,700
DG2S	D	I	S	Filtered	24,200	135	5,170	1,180	637 B	9,860
DG3S	D	O	S	Filtered	18,900	1,700	4,210 B	2,940	608 B	11,100
DG4D	D	O	D	Filtered	22,200	53 B	4,580 B	4,200	1,640 B	9,320
Average					24,825	492	5,568	3,110	1,209	10,245
Influent					29,100	109	6,740	2,650	1,294	10,280
Effluent					20,550	876	4,395	3,570	1,124	10,210
EG1S	E	I	S	Filtered	24,000	1,140	7,320	6,980	2,140 B	13,600
EG2D	E	I	D	Filtered	45,400	69 B	11,600	1,160	4,800 B	12,600
EG3S	E	O	S	Filtered	19,500	7,630	8,190	2,460	2,650 B	9,170
EG4D	E	O	D	Filtered	29,400	142	4,250 B	157	1,530 B	16,000
Average					29,575	2,245	7,840	2,689	2,780	12,843
Influent					34,700	605	9,460	4,070	3,470	13,100
Effluent					24,450	3,886	6,220	1,309	2,090	12,585
WG1D	W	I	D	Filtered	31,600	3,970	9,690	8,610	1,960 B	65,200
WG2S	W	I	S	Filtered	23,300	19,900	9,930	13,600	1,010 B	34,400
WG3S	W	O	S	Filtered	15,000	15,700	3,580 B	10,400	856 B	29,400
WG4D	W	O	D	Filtered	22,600	538	6,120	4,440	12,800	50,900
Average					23,125	10,027	7,330	9,263	4,157	44,975
Influent					27,450	11,935	9,810	11,105	1,485	49,800
Effluent					18,800	8,119	4,850	7,420	6,828	40,150

Note: When compound is undetected, as indicated by a U, detection limit is shown, but default value of 1 ug/l is used in calculations.

TABLE VII-MIN: RESULTS OF ANALYSES OF SAMPLES COLLECTED JUNE 2000

Well	Gate	Loc	Depth	Type	Calcium ug/l	Iron ug/l	Magnesium ug/l	Manganese ug/l	Potasium ug/l	Sodium ug/l
AG01D	A	I	D	Filtered	15,600	50.5 B	5,260	139	1,360 B	58,300
AG02S	A	I	S	Filtered	11,000	7,940	3,350 B	1,450	982 B	21,000
AG03D	A	O	D	Filtered	17,300	261	3,740 B	2,030	1470 B	54,000
AG04S	A	O	S	Filtered	22,100	13,600	4,750 B	7,980	919 B	30,300
AG05S	A	I	S	Filtered	14,100	210	4,040 B	574	1,320 B	30,600
AG06D	A	I	D	Filtered	21,500	45.6 U	5,570	147	2,340 B	38,400
AG07S	A	O	S	Filtered	10,700	45.6 U	2240 B	151	1590 B	22,000
AG08D	A	O	D	Filtered	14,200	58.4 B	2180 B	219	2,120 B	26,400
AG09D	A	I	D	Filtered	10,100	45.6 U	2,390 B	292	340 B	5,460
AG10S	A	I	S	Filtered	14,800	7,860	3,070 B	5,850	945 B	13,800
AG11S	A	O	S	Filtered	6,420	206	825 B	26	360 B	3,550 B
AG12D	A	O	D	Filtered	9,330	77.8 B	238 B	7.3 B	527 B	6,470
AG13D	A	O	D	Filtered	13,000	45.6 U	2030 B	21.3	2680 B	25,700
Average										
Influent										
Effluent										
DG1D	D	I	D	Filtered	33,900	45.6 U	8,090	3,610	1,730 B	11,400
DG2S	D	I	S	Filtered	20,000	107	3,900 B	1,020	570 B	4,290 B
DG3S	D	O	S	Filtered	20,900	1,040	5,530	3,670	448 B	5,000 B
DG4D	D	O	D	Filtered	18,600	45.6 U	3,800 B	6,400	1,650 B	10,500
DG5D	D	O	D	Filtered	23,000	391	3,480 B	214	3,160 B	21,200
DG6S	D	O	S	Filtered	15,500	90.3 B	2,550 B	19	1,420 B	8,390
Average										
Influent										
Effluent										
EG1S	E	I	S	Filtered	20,600	933	6,840	8,740	2,150 B	14,900
EG2D	E	I	D	Filtered	58,600	45.6 U	14,400	786	1,510 B	17,900
EG3S	E	O	S	Filtered	20,400	3,020	7,690	1,140	2,490 B	11,100
EG4D	E	O	D	Filtered	31,800	58.5 B	4,410 B	168	1,390 B	16,200
Average										
Influent										
Effluent										
WG1D	W	I	D	Filtered	15,300	314	4,340 B	680	906 B	50,200
WG2S	W	I	S	Filtered	18,200	2,930	5,420	3,860	1,030 B	42,600
WG3S	W	O	S	Filtered	14,200	71 B	4,260 B	426	824 B	29,400
WG4D	W	O	D	Filtered	15,800	124	4,510 B	852	988 B	44,300
Average										
Influent										
Effluent										

Note: When compound is undetected, as indicated by a U, detection limit is shown, but default value of 1 ug/l is used in calculations.

TABLE VIII-IND: RESULTS OF ANALYSES OF SAMPLES COLLECTED SEPTEMBER 2000

Well	Gate	Loc	Depth	Type	pH	Spec Cond uS/cm	Temp C	ORP mV	Chloride mg/l	Sulfate mg/l	Nitrate N as N mg/l	Hydroxide alkalinity mg/l	Carbonate alkalinity mg/l	Bicar-bonate alkalinity mg/l	Total alkalinity mg/l	Total Phosphate as P mg/l	Total Dissolved Solids mg/l	Dissolved Oxygen mg/l
Influent					7.44	279	15.9	5.3	35.6	10.4	1.1	1.0	1.0	43	43	0.32	109	2.2
Effluent					8.23	183	15.6	-195	35.2	0.9	0.2	1.0	1.8	36	37	0.32	104	1.7
DG1D	D	I	D	Filtered	8.19	185	16.7	-47	17.4	9.5 <	0.2 <	1 <	1	108	108	0.08	167	9.2
DG2S	D	I	S	Filtered	7.68	257	14.6	30	7.7	9.6 <	0.2 <	1 <	1	88	88	0.29	119	2.0
DG3S	D	O	S	Filtered	7.86	206	16.3	19	3.8	0.3 <	0.2 <	1 <	1	108	108	0.06	105	0.9
DG4D	D	O	D	Filtered	7.71	200	14.7	43	17.5	5.1 <	0.2 <	1 <	1	100	100	0.06	140	8.6
DG5D	D	O	D	Filtered	8.68	163	13.5	-36	12.2	0.5 <	0.2 <	1 <	1	108	108	0.21	132	0.9
DG6S	D	O	S	Filtered	8.58	99	16.6	10	4.5	0.3 <	0.2 <	1 <	1	48	48 <	0.01	94	2.3
Removal %					-5%	30%	5%	167%	9%	79%	0%	0%	0%	13%	13%	50%	15%	30%
Influent					7.94	221	15.7	-9	12.6	9.6	0.2	1.0	1.0	98	98	0.19	143	5.6
Effluent					8.32	154	14.9	6	11.4	2.0	0.2	1.0	1.0	85	85	0.09	122	3.9
EG1S	E	I	S	Filtered	6.54	232	15.1	13	28.9	11.4	0.4 <	1 <	1	76	76	0.1	152	2.3
EG2D	E	I	D	Filtered	6.35	384	12.6	44	56.6	2.0 <	0.2 <	1 <	1	156	156	0.66	257	5.4
EG3S	E	O	S	Filtered	7.32	209	15.6	-241	28.1 <	0.2 <	0.2 <	1 <	1	54	54	0.49	114	3.0
EG4D	E	O	D	Filtered	6.44	268	14.0	-13	66.3	0.6 <	0.2 <	1 <	1	50	50	0.49	191	7.3
Removal %					-7%	23%	-7%	546%	-10%	94%	33%	0%	0%	55%	55%	-29%	25%	-34%
Influent					6.45	308	13.9	29	42.8	6.7	0.3	1.0	1.0	116	116	0.38	205	3.9
Effluent					6.88	239	14.8	-127	47.2	0.4	0.2	1.0	1.0	52	52	0.49	153	5.2
WG1D	West	I	D	Filtered	7.15	315	12.4	14	57.4	10.2 <	0.2 <	1 <	1	84	84	0.38	535	3.6
WG2S	West	I	S	Filtered	7.55	318	17.4	NA	59.6	9.4 <	0.2 <	1 <	1	80	80	0.50	313	1.5
WG3S	West	O	S	Filtered	6.82	267	17.0	-57	55.2	1.0 <	0.2 <	1 <	1	50	50	0.59	684	1.1
WG4D	West	O	D	Filtered	6.89	349	18.0	20	49.4	8.7 <	0.2 <	1 <	1	124	124	7.9	202	7.1
Removal %					7%	3%	-17%	232%	11%	51%	0%	0%	0%	-6%	-6%	-865%	-4%	-61%
Influent					7.35	317	14.9	14	58.5	9.8	0.2	1.0	1.0	82	82	0.44	424	2.6
Effluent					6.86	308	17.5	-19	52.3	4.9	0.2	1.0	1.0	87	87	4.25	443	4.1

Note: When compound was undetected, as indicated by a U, detection limit was shown, but default value of 0.1 ug/l was used in calculations.

TABLE I-IND: RESULTS OF ANALYSES OF SAMPLES COLLECTED NOVEMBER 1998

Well	Gate	Loc	Depth	Type	pH	Spec Cond uS/cm	Temp C	ORP mV	Chloride mg/l	Sulfate mg/l	Nitrate N as N mg/l	Hydroxide alkalinity mg/l	Carbonate alkalinity mg/l	Bicar-bonate alkalinity mg/l	Total alkalinity mg/l	Total Phosphate as P mg/l	Total Dissolved Solids mg/l	Dissolved Oxygen mg/l
AG01D	A	I	D	Filtered	6.8	235	12.9	59	37.5	10.2	0.7	1 U	1 U	51	51	0.3	147	4.05
AG02S	A	I	S	Filtered	7	252	12.3	-37	26.1	5.8	0.3 U	1 U	1 U	70	70	0.56	130	1.2
AG03D	A	O	D	Filtered	7.4	277	12.9	132	38.5	20.2	0.3 U	1 U	1 U	53	53	3.48	157	3.3
AG04S	A	O	S	Filtered	7	269	13.2	-24	32	15.3	0.3 U	1 U	1 U	84	84	7.85	176	4.1
AG05S	A	I	S	Filtered	6.8	198	10.3	112	15.3	6.7	0.3 U	1 U	1 U	70	70	7.66	121	2.6
AG06D	A	I	D	Filtered	6.8	254	10.3	31	43.6	16.7	2.5	1 U	1 U	48	48	2.94	175	3
AG07S	A	O	S	Filtered	8.3	181	10.6	-231	38.4	16.7	0.3 U	1 U	1 U	22	22	10.2	141	3.9
AG08D	A	O	D	Filtered	6.9	209	11.4	-191	37.8	20.7	0.3 U	1 U	1 U	23	23	6.98	144	2.1
AG09D	A	I	D	Filtered	7.2	74.6	9.7	158	5.6	7.9	0.3 U	1 U	1 U	23	23	0.87	87	3.8
AG10S	A	I	S	Filtered	6.7	142	8.7	159	2.4	17.1	0.3 U	1 U	1 U	56	56	4.48	98	6.6
AG11S	A	O	S	Filtered	6.8	132	9.6	85	5.4	19.9	0.3 U	1 U	1 U	36	36	1.38	253	3.5
AG12D	A	O	D	Filtered	7.1	114	10.1	61	6.6	20.8	0.1 U	0.1 U	0.1 U	34	34	1.69	168	3.93
Average					7.1	195	11	26	24.1	14.8	0.3	0.1	0.1	48	48	4.03	150	3.51
Influent					6.9	193	10.7	80	21.8	10.7	0.6	0.1	0.1	53	53	2.8	126.3	3.5
Effluent					7.3	197	11.3	-28	26.5	18.9	0.1	0.1	0.1	42	42	5.3	173.2	3.5
DG1D	D	I	D	Filtered	6.9	342	10.3	122	14.9	23.8	0.3 U	1 U	1 U	154	154	0.96	220	9.6
DG2S	D	I	S	Filtered	7.1	168	9.7	112	9.7	11.5	0.3 U	1 U	1 U	71	71	0.99	127	2.25
DG3S	D	O	S	Filtered	6.9	106	9.6	-26	4.1	2.1	0.3 U	1 U	1 U	47	47	0.08	55	3.25
DG4D	D	O	D	Filtered	6.9	2630	11.2	121	21.8	4.1	0.3 U	1 U	1 U	86	86	0.09	119	9.5
Average					7	812	10.2	82	12.6	10.4	0.1	0.1	0.1	90	90	0.53	130	6.15
Influent					7	255	10	117	12.3	17.7	0.1	0.1	0.1	113	113	0.98	174	5.93
Effluent					6.9	1,368	10.4	48	13	3.1	0.1	0.1	0.1	67	67	0.09	87	6.38
EG1S	E	I	S	Filtered	6.5	236	9.7	124	28.4	11.6	0.3 U	1 U	1 U	64	64	0.13	136	4.1
EG2D	E	I	D	Filtered	7	376	10.2	102	29.6	33.2	0.3 U	1 U	1 U	154	154	0.18	269	8.8
EG3S	E	O	S	Filtered	6.8	152	10.7	-192	17.8	6.6	0.3 U	1 U	1 U	45	45	0.25	111	2.45
EG4D	E	O	D	Filtered	7.1	318	10.7	98	37.8	10.9	0.1 U	0.1 U	0.1 U	123	123	0.97	252	5
Average					6.9	271	10.3	33	28.4	15.6	0.1	0.1	0.1	97	97	0.38	192	5.09
Influent					6.8	306	10	113	29	22.4	0.1	0.1	0.1	109	109	0.16	203	6.45
Effluent					7	235	10.7	-47	27.8	8.8	0.1	0.1	0.1	84	84	0.61	182	3.73
WG1D	West	I	D	Filtered	6.7	185	9.5	252	19.7	28.4	0.3 U	1 U	1 U	142	142	0.46	252	6.7
WG2S	West	I	S	Filtered	6.9	226	9.7	265	18.8	11.6	0.3 U	1 U	1 U	92	92	0.83	153	6.4
WG3S	West	O	S	Filtered	6.6	178	10.3	-217	22.7	4.2	0.3 U	1 U	1 U	60	60	0.4	320	2.55
WG4D	West	O	D	Filtered	7.5	265	11.8	105	20.2	26.1	0.3 U	1 U	1 U	82	82	2.56	883	5.7
Average					6.9	214	10.3	101	20.4	17.6	0.1	0.1	0.1	94	94	1.06	402	5.34
Influent					6.8	206	9.6	259	19.3	20	0.1	0.1	0.1	117	117	0.65	203	6.55
Effluent					7.1	222	11.1	-56	21.5	15.2	0.1	0.1	0.1	71	71	1.48	602	4.13
QC																		
AG12D	A	O	D	Filtered					6.6	21.2	0.3 U	1 U	1 U	36	36	1.15 J	175	4.7 J
AG12D-dup	A	O	D	Filtered					6.6	20.4	0.3 U	1 U	1 U	32	32	2.23 J	161	3.15 J
Average									6.6	20.8	0.1	0.1	0.1	34	34	1.69	168	3.93
RPD									0%	4%	0%	0%	0%	12%	12%	-64%	8%	39%
EG4D	E	O	D	Filtered					36.4	11.5	0.3 U	1 U	1 U	124	124	1.54 J	259	4.65
EG4D-dup	E	O	D	Filtered					39.1	10.3	0.3 U	1 U	1 U	122	122	0.4 J	245	5.35
Average									37.8	10.9	0.1	0.1	0.1	123	123	0.97	252	5
RPD									-7%	11%	0%	0%	0%	2%	2%	118%	6%	-14%

Note: When compound was undetected, as indicated by a U, detection limit was shown, but default value of 0.1 ug/l was used in calculations

TABLE II-IND: RESULTS OF ANALYSES OF SAMPLES COLLECTED MARCH 1999

Well	Gate	Loc	Depth	Type	pH	Spec Cond uS/cm	Temp C	ORP mV	Chloride mg/l	Sulfate mg/l	Nitrate N as N mg/l	Hydroxide alkalinity mg/l	Carbonate alkalinity mg/l	Bicarbona alkalinity mg/l	Total alkalinity mg/l	Total Phosphate as P mg/l	Total Dissolved Solids mg/l	Dissolved Oxygen mg/l
AG01D	A	I	D	Filtered	6.3	267	6.5	66	24.6	11.6	0.4	1 U	1 U	55	55	0.26	115	2.3
AG02S	A	I	S	Filtered	7	256	4.7	-81	14.4	6.4	0.2 U	1 U	1 U	67	67	0.5	112	0.75
AG03D	A	O	D	Filtered	7	199	7.4	-63	27.7	2.9	0.2 U	1 U	1 U	48	48	2.57	110	1.5
AG04S	A	O	S	Filtered	6.9	267	5.2	-84	22.5	5.8	0.2 U	1 U	1 U	82	82	5.04	152	0.65
AG05S	A	I	S	Filtered	6.5	230	5.9	-12	26.5	15.3	0.5	1 U	1 U	54	54	0.02 U	114	2.05
AG06D	A	I	D	Filtered	6.3	315	5	135	49.1	15.3	1.9	1 U	1 U	51	51	0.37	162	2.1
AG07S	A	O	S	Filtered	10	182	5.7	-201	35.5	3.2	0.2 U	1 U	9	15	24	0.39	104	1.1
AG08D	A	O	D	Filtered	7.8	222	5.9	-499	45.7	5.6	0.2 U	1 U	1 U	30	30	4.15	154	2.05
AG09D	A	I	D	Filtered	6	64.3	4.9	-10	4.5	7.7	0.1 U	0.1 U	0.1 U	22	22	0.47	75	4.78
AG10S	A	I	S	Filtered	5.6	116	3.4	60	2.1	10.5	0.2 U	1 U	1 U	44	44	0.5	92	4
AG11S	A	O	S	Filtered	8.6	68	4.8	-152	4.1	7.5	0.2 U	1 U	1 U	17	17	0.59 J	144	1.7
AG12D	A	O	D	Filtered	8.2	92	5.5	-94	5.9	12.2	0.2 U	1 U	6	19	25	0.27 J	321	2.55
Average					7.2	190	5.4	-78	21.9	8.7	0.3	0.1	1.3	42	43	1.3	138	2.13
Influent					6.3	208	5.1	26	20.2	11.1	0.5	0.1	0.1	49	49	0.4	112	2.66
Effluent					8.1	172	5.8	-182	23.6	6.2	0.1	0.1	2.6	35	38	2.2	164	1.59
DG1D	D	I	D	Filtered	7.3	373	9.9	226	15.1	13	0.2 U	1 U	1 U	125	125	6.8 J	219	5.4
DG2S	D	I	S	Filtered	7.4	163	7.5	79	8.8	8	0.2 U	1 U	1 U	63	63	0.54 J	143	1.9
DG3S	D	O	S	Filtered	7.3	193	6.4	63	10.5	3.5	0.2 U	1 U	1 U	47	47	0.36 J	107	1.2
DG4D	D	O	D	Filtered	7.5	238	9.4	84	16.3	8.9	0.1 U	0.1 U	0.1 U	80	80	0.91 J	178 J	3.3 J
Average					7.4	242	8.3	113	12.7	8.4	0.1	0.1	0.1	79	79	2.2	162	2.95
Influent					7.4	268	8.7	153	12	10.5	0.1	0.1	0.1	94	94	3.7 J	181	3.65
Effluent					7.4	216	7.9	74	13.4	6.2	0.1	0.1	0.1	64	64	0.6 J	143 J	2.25
EG1S	E	I	S	Filtered	6.5	293	6	88	28.6	12.2	0.2 U	1 U	1 U	94	94	6.7 J	190	5
EG2D	E	I	D	Filtered	7.6	379	9	14	34.6	20	0.2 U	1 U	1 U	136	136	19.5 J	250	3.25
EG3S	E	O	S	Filtered	7.4	201	7.8	461	18.1	0.3 U	0.2 U	1 U	1 U	61	61	0.44 J	140	1.7
EG4D	E	O	D	Filtered	7.5	316	10	-36	46.6	6.5	0.2 U	1 U	1 U	71	71	6.4	232	5.6
Average					7.3	297	8.2	132	32	9.7	0.1	0.1	0.1	91	91	8.3	203	3.89
Influent					7.1	336	7.5	51	31.6	16.1	0.1	0.1	0.1	115	115	13.1 J	220	4.13
Effluent					7.5	259	8.9	213	32.4	3.3	0.1	0.1	0.1	66	66	3.4 J	186 J	3.65
WG1D	West	I	D	Filtered	7.7	500	8.1	33	18	43	0.2 U	1 U	1 U	242	242	1.5	336	2.5
WG2S	West	I	S	Filtered	6.4	378	7.1	30	23.4	22.5	0.4	1 U	1 U	98	98	5.04	190	6.3
WG3S	West	O	S	Filtered	7.1	341	5.6	-103	11.8	31.2	0.2 U	1 U	1 U	156	156	5.25	245	1
WG4D	West	O	D	Filtered	7.9	345	7.5	90	15.4	38.9	0.2 U	1 U	1 U	132	132	4.73	282	3
Average					7.3	391	7.1	13	17.2	33.9	0.2	0.1	0.1	157	157	4.1	263	3.2
Influent					7.1	439	7.6	32	20.7	32.8	0.3	0.1	0.1	170	170	3.3 J	263	4.4
Effluent					7.5	343	6.6	-7	13.6	35.1	0.1	0.1	0.1	144	144	5 J	264 J	2
QC																		
AG09D	A	O	D	Filtered					4.4	7.6	0.2 U	1 U	1 U	22	22	0.47	65 J	3.8 J
AG09D-dup	A	O	D	Filtered					4.5	7.8	0.2 U	1 U	1 U	23	23	0.46 J	84 J	5.75 J
Average									4.5	7.7	0.1	0.1	0.1	22	22	0.5 J	75 J	4.78 J
RPD									-2%	-3%	0%	0%	0%	-2%	-2%	2%	-26%	-41%
DG4D	E	O	D	Filtered					15.9	8.9	0.2 U	1 U	1 U	80	80	1.2 J	170 J	3.3 J
DG4D-dup	E	O	D	Filtered					16.6	8.9	0.2 U	1 U	1 U	80	80	0.61 J	186 J	3.3 J
Average									16.3	8.9	0.1	0.1	0.1	80	80	0.9 J	178 J	3.3 J
RPD									-4%	0%	0%	0%	0%	0%	0%	65%	-9%	0%

Note: When compound was undetected, as indicated by a U, detection limit was shown, but default value of 0.1 ug/l was used in calculations.

TABLE III-IND: RESULTS OF ANALYSES OF SAMPLES COLLECTED JUNE 1999

Well	Gate	Loc	Depth	Type	pH	Spec Cond uS/cm	Temp C	ORP mV	Chloride mg/l	Sulfate mg/l	Nitrate N as N mg/l	Hydroxide alkalinity mg/l	Carbonate alkalinity mg/l	Bicar-bonate alkalinity mg/l	Total alkalinity mg/l	Total Phosphate as P mg/l	Total Dissolved Solids mg/l	Dissolved Oxygen mg/l
AG01D	A	I	D	Filtered	6.9	191	14.4	117	17.4 J	9.9	0.3 J	1 U	1 U	53	53	0.3 J	98	1.7 J
AG02S	A	I	S	Filtered	7	207	16.2	-132	10.3 J	1.5	0.2 UJ	1 U	1 U	102	102	0.46 J	114	0 J
AG03D	A	O	D	Filtered	7.2	213	15.5	-85	19.6 J	2	0.2 UJ	1 U	1 U	62	62	0.53 J	113	5.35 J
AG04S	A	O	S	Filtered	6.6	316	17.6	-66	16.5 J	3.9	0.2 UJ	1 U	1 U	90	90	0.55 J	153	1.2 J
AG05S	A	I	S	Filtered	6.7	236	17.1	48	27 J	13.6	0.5 J	1 U	1 U	75	75	2.9 J	141	2.85 J
AG06D	A	I	D	Filtered	7.1	280	15.1	176	44.9 J	15.6	2.2 J	1 U	1 U	47	47	0.53 J	155	3.5 J
AG07S	A	O	S	Filtered	7.5	223	17.3	-379	27.6 J	2.7	0.2 UJ	1 U	1 U	138	138	9 J	109	0 J
AG08D	A	O	D	Filtered	8	243	13.5	-327	47.1 J	2.4	0.2 UJ	1 U	1 U	28	28	0.62 J	116	1.25 J
AG09D	A	I	D	Filtered	6.7	211	14.2	98	5.4	8	0.2 U	1 U	1 U	26	26	1.7 J	67	3.3
AG10S	A	I	S	Filtered	7.5	103	14.9	68	3.1	8.6	0.2 U	1 U	1 U	47	47	1.9 J	82	3.5
AG11S	A	O	S	Filtered	8	61	15.4	-277	3	7.1	0.2 U	1 U	1 U	40	40	3.1 J	219	1.9
AG12D	A	O	D	Filtered	8.8	78	13.2	-144	4.3	8.1	0.2 U	1 U	1 U	30	30	1 J	377	3.6
Average					7.3	197	15.4	-75	18.9	7	0.3	0.1	0.1	62	62	1.88	145	2.35
Influent					7	205	15.3	63	18	9.5	0.6	0.1	0.1	58	58	1.3	110	2.48
Effluent					7.7	189	15.4	-213	19.7	4.4	0.1	0.1	0.1	65	65	2.47	181	2.22
DG1D	D	I	D	Filtered	7.3	286	11.6	12	14.8	13.4	0.2 U	1 U	1 U	142	142	2.1 J	172	8.4
DG2S	D	I	S	Filtered	6.9	256	16.9	-38	5.7	4.4	0.2 U	1 U	1 U	55	55	0.31 J	90	2.2
DG3S	D	O	S	Filtered	7.4	179	20.4	-115	8.6	1.1	0.2 U	1 U	1 U	63	63	0.46 J	88	1.3
DG4D	D	O	D	Filtered	7.9	205	14.3	10	15.2	8.6	0.2 U	1 U	1 U	68	68	0.06 J	124	9.4
Average					7.4	232	15.8	-33	11.1	6.9	0.1	0.1	0.1	82	82	0.73	119	5.33
Influent					7.1	271	14.3	-13	10.3	8.9	0.1	0.1	0.1	99	99	1.21 J	131	5.3
Effluent					7.7	192	17.4	-53	11.9	4.9	0.1	0.1	0.1	66	66	0.26 J	106 J	5.35
EG1S	E	I	S	Filtered	6.6	261	15.5	41	30	12	0.2 U	1 U	1 U	80	80	0.1 J	163	2.6
EG2D	E	I	D	Filtered	7.3	378	10.7	-6	36.7	18.5	0.2 U	1 U	1 U	139	139	6.1 J	259	7.5
EG3S	E	O	S	Filtered	8	194	13.8	-101	17.7	0.9 U	0.2 U	1 U	1 U	75	75	5.8 J	136	2.3
EG4D	E	O	D	Filtered	7.5	302	14.3	10	46.1	4.1	0.2 U	1 U	1 U	74	74	2.6 J	228	6.6
Average					7.4	284	13.6	-14	32.6	8.7	0.1	0.1	0.1	92	92	3.65	197	4.75
Influent					7	320	13.1	18	33.4	15.3	0.1	0.1	0.1	110	110	3.1 J	211	5.05
Effluent					7.8	248	14.1	-46	31.9	2.1	0.1	0.1	0.1	75	75	4.2 J	182 J	4.45
WG1D	West	I	D	Filtered	7	657	14.4	114	84 J	32.6	0.2 UJ	1 U	1 U	186	186	0.41 J	354	3.3 J
WG2S	West	I	S	Filtered	6.9	604	15.7	152	160 J	5.3	0.2 UJ	1 U	1 U	54	54	0.5 J	397	2.85 J
WG3S	West	O	S	Filtered	7.6	518	16.2	-158	122 J	4	0.2 UJ	1 U	1 U	123	123	6.5 J	342	1 J
WG4D	West	O	D	Filtered	7.7	496	15.1	181	111 J	14.5	0.2 UJ	1 U	1 U	78	78	0.23 J	278	4.85 J
Average					7.3	569	15.4	72	119.3 J	14.1	0.1	0.1	0.1	110	110	1.91 J	343	3
Influent					7	631	15.1	133	122 J	19	0.1	0.1	0.1	120	120	0.46 J	376	3.08
Effluent					7.7	507	15.7	12	116.5 J	9.3	0.1	0.1	0.1	101	101	3.37 J	310 J	2.93

Note: When compound was undetected, as indicated by a U, detection limit was shown, but default value of 0.1 ug/l was used in calculations.

TABLE IV-IND: RESULTS OF ANALYSES OF SAMPLES COLLECTED SEPTEMBER 1999

Well	Gate	Loc	Depth	Type	pH	Spec Cond uS/cm	Temp C	ORP mV	Chloride mg/l	Sulfate mg/l	Nitrate N as N mg/l	Hydroxide alkalinity mg/l	Carbonate alkalinity mg/l	Bicar-bonate alkalinity mg/l	Total alkalinity mg/l	Total Phosphate as P mg/l	Total Dissolved Solids mg/l	Dissolved Oxygen mg/l
AG01D	A	I	D	Filtered	6.4	235	17.1	67	37	10.3	0.4	1 U	1 U	66	66	0.26 J	132	2.25
AG02S	A	I	S	Filtered	6.8	371	17.2	-97	59	0.7	0.2 U	1 U	1 U	63	63	0.43 J	172	0.55
AG03D	A	O	D	Filtered	7.1	204	17.3	-104	17.5	0.7	0.2 U	1 U	1 U	58	58	0.59 J	98	1.4
AG04S	A	O	S	Filtered	6.7	348	18.1	3										
AG05S	A	I	S	Filtered	6.7	309	16.8	28	36.6	12.6	1.1	1 U	1 U	73	73	6.1 J	158	2.45
AG06D	A	I	D	Filtered	6.4	374	18.6	201	54.1	14.9	3.4	1 U	1 U	43	43	0.44 J	171	2.5
AG07S	A	O	S	Filtered	6.9	231	17.7	-492	41	0.4	0.2 U	1 U	1 U	38	38	5.5 J	133	0.65
AG08D	A	O	D	Filtered	7.3	275	17.1	-281	43.2	2.1	0.2 U	1 U	1 U	51	51	0.55 J	137	1.4
AG09D	A	I	D	Filtered	6.8	231	16.9	197	9.7	10.1	0.4	1 U	1 U	23	23	0.33 J	67	6.4
AG10S	A	I	S	Filtered	6.4	201	16.5	128	23.6	10.7	0.5	1 U	1 U	53	53	1.4 J	101	3.15
AG11S	A	O	S	Filtered	8	130	18	-236	20.8	2.6	0.2 U	1 U	1 U	21	21	0.53 J	101	1.85
AG12D	A	O	D	Filtered	8	1293	16.2	75	26.8	3.2	0.2 U	1 U	6	15	21	0.26 J	219	7.15
Average					7	350	17.3	-43	33.6	6.2	0.5	0.1	0.6	46	46	1.49	135	2.7
Influent					6.6	287	17.2	87	36.7	9.9	1	0.1	0.1	54	54	1.49	134	2.88
Effluent					7.3	414	17.4	-173	29.9	1.8	0.1	0.1	1.1	37	38	1.49	138	2.49
DG1D	D	I	D	Filtered	7	315	16.8	43	19	9.5	0.2 U	1 U	1 U	124	124	0.1	165	8.6
DG2S	D	I	S	Filtered	7.2	187	17.3	-9	11.4	7.7	0.2 U	1 U	1 U	59	59	0.23	87	1.4
DG3S	D	O	S	Filtered	7.2	143	18.2	-68	4.1	0.5	0.2 U	1 U	1 U	59	59	0.09	84	1.4
DG4D	D	O	D	Filtered	7.5	200	16.8	123	15	5.9	0.2 U	1 U	1 U	77	77	0.05	131	5.45
Average					7.2	211	17.3	22	12.4	5.9	0.1	0.1	0.1	80	80	0.12	117	4.21
Influent					7.1	251	17.1	17	15.2	8.6	0.1	0.1	0.1	92	92	0.17 J	126	5
Effluent					7.4	172	17.5	28	9.6	3.2	0.1	0.1	0.1	68	68	0.07 J	108 J	3.43
EG1S	E	I	S	Filtered	6.5	275	18.5	110	28.2	12.3	0.2	1 U	1 U	81	81	0.47	149	1.95
EG2D	E	I	D	Filtered	7.4	387	14.2	-60	33	13.1	0.2 U	1 U	1 U	134	134	12.8	216	2.8
EG3S	E	O	S	Filtered	7.7	199	19.1	-351	22.4	0.4	0.2 U	1 U	1 U	45	45	0.14	94	1
EG4D	E	O	D	Filtered	7.1	349	14.9	-61	53.1	3.3	0.2 U	1 U	1 U	69	69	0.6	171	5.6
Average					7.2	303	16.7	-91	34.2	7.3	0.1	0.1	0.1	82	82	3.5	158	2.84
Influent					7	331	16.4	25	30.6	12.7	0.2	0.1	0.1	108	108	6.64 J	183	2.38
Effluent					7.4	274	17	-206	37.8	1.9	0.1	0.1	0.1	57	57	0.37 J	133 J	3.3
WG1D	West	I	D	Filtered	7	694	15.8	-58	107	24.1	0.2 U	1 U	1 U	172	172	4.3 J	414	3.65
WG2S	West	I	S	Filtered	6.8	552	16.2	-31	119	12.4	0.2 U	1 U	1 U	79	79	1.6 J	330	2.65
WG3S	West	O	S	Filtered	6.7	893	17.3	-92	144	4.6	0.2 U	1 U	1 U	164	164	5.7 J	435	1.05
WG4D	West	O	D	Filtered	7.1	650	16.1	-87	100	15.4	0.2 U	1 U	1 U	168	168	2.9 J	352	1.2
Average					6.9	697	16.4	-67	117.5 J	14.1	0.1	0.1	0.1	146	146	3.63 J	383	2.14
Influent					6.9	623	16	-45	113 J	18.3	0.1	0.1	0.1	126	126	2.95 J	372	3.15
Effluent					6.9	772	16.7	-90	122 J	10	0.1	0.1	0.1	166	166	4.3 J	394 J	1.13

Note: When compound was undetected. as indicated by a U. detection limit was shown, but default value of 0.1 ug/l was used in calculations.

TABLE V-IND: RESULTS OF ANALYSES OF SAMPLES COLLECTED DECEMBER 1999

Well	Gate	Loc	Depth	Type	pH	Spec Cond uS/cm	Temp C	ORP mV	Chloride mg/l	Sulfate mg/l	Nitrate N as N mg/l	Hydroxide alkalinity mg/l	Carbonate alkalinity mg/l	Bicar-bonate alkalinity mg/l	Total alkalinity mg/l	Total Phosphate as P mg/l	Total Dissolved Solids mg/l	Dissolved Oxygen mg/l
AG01D	A	I	D	Filtered	6.9	401	8.3	49	115	6.5	0.4	1 U	1 U	40	40	0.21	247	2.1
AG02S	A	I	S	Filtered	7	347	8.5	-58	69.4	0.6	0.2 U	1 U	1 U	56	56	0.52	181	0.6
AG03D	A	O	D	Filtered	7.5	360	7.6	-83	56.3	0.5	0.2 U	1 U	1 U	52	52	0.08	156	1.6
AG04S	A	O	S	Filtered														
AG05S	A	I	S	Filtered	6.9	230	7.2	-19	25.6	5.5	1	1 U	1 U	44	44	4.1	118	2.55
AG06D	A	I	D	Filtered	6.6	298	8.5	119	52.5	12.9	3.4	1 U	1 U	52	52	8.2	204	3
AG07S	A	O	S	Filtered	7.4	147	7.3	-352	29.6	0.4	0.2 U	1 U	1 U	20	20	0.15	95	1.1
AG08D	A	O	D	Filtered	7	173	8.3	-363	37.1	0.4	0.2 U	1 U	1 U	32	32	0.16	112	3.15
AG09D	A	I	D	Filtered	8.4	193	8.2	82	26	11.4	1.1	1 U	1 U	52	52	0.11	119	3
AG10S	A	I	S	Filtered	8.4	152	8.4	33	14.1	9.4	0.2	1 U	1 U	33	33	0.1	69	4.9
AG11S	A	O	S	Filtered	9.2	140	8.1	-250	24.9	4.7	0.2 U	1 U	8	42	50	0.51	160	1.8
AG12D	A	O	D	Filtered	9	1643	8.7	4	16.2	1.4	0.2 U	1 U	1 U	27	27	0.25	50	4
Average					7.6	371	8.1	-76	42.4	4.9	0.6	0.1	0.8	41	42	1.31	137	2.53
Influent					7.3	270	8.2	34	50.4	7.7	1	0.1	0.1	46	46	2.21	156	2.69
Effluent					8	493	8	-209	32.8	1.5	0.1	0.1	1.4	35	36	0.23	115	2.33
DG1D	D	I	D	Filtered	8.1	326	10.9	98	17.8	8.8	0.2 U	1 U	1 U	126	126	0.32	153	5.1
DG2S	D	I	S	Filtered	8.6	163	7.7	62	13	7.1	0.2 U	1 U	1 U	53	53	0.13	62	1.6
DG3S	D	O	S	Filtered	8	136	7.9	-26	9.3	1	0.2 U	1 U	1 U	50	50	0.49	65	1.6
DG4D	D	O	D	Filtered	7.9	212	8.8	15	15.8	4.8	0.2 U	1 U	1 U	77	77	0.15	92	6.2
Average					8.1	209	8.8	37	14	5.4	0.1	0.1	0.1	77	77	0.27	93	3.63
Influent					8.3	245	9.3	80	15.4	8	0.1	0.1	0.1	90	90	0.23	108	3.35
Effluent					7.9	174	8.4	-6	12.6	2.9	0.1	0.1	0.1	64	64	0.32	79	3.9
EG1S	E	I	S	Filtered	8	399	4.1	-25	33.4	12	0.3	1 U	1 U	87	87	1.5	125	3.05
EG2D	E	I	D	Filtered	7.6	462	6.2	124	60	6.5	0.2 U	1 U	1 U	147	147	0.43	271	2.65
EG3S	E	O	S	Filtered	7.5	232	8.3	-265	27.6	0.2	0.2 U	1 U	1 U	65	65	0.12	120	1.15
EG4D	E	O	D	Filtered	7.9	300	7.9	122	60.4	1.6	0.2 U	1 U	1 U	49	49	9.5	176	5.25
Average					7.7	348	6.6	-11	45.4	5.1	0.2	0.1	0.1	87	87	2.89	173	3.03
Influent					7.8	431	5.2	50	46.7	9.3	0.2	0.1	0.1	117	117	0.97	198	2.85
Effluent					7.7	266	8.1	-72	44	0.9	0.1	0.1	0.1	57	57	4.81	148	3.2
WG1D	West	I	D	Filtered	7.3	592	9	71	136	12.7	0.4	1 U	1 U	102	102	0.58	347	6.1
WG2S	West	I	S	Filtered	7	585	8.5	102	148	8.3	0.4	1 U	1 U	78	78	0.57	349	4.55
WG3S	West	O	S	Filtered	7.9	529	8.3	72	132	0.7	0.2 U	1 U	1 U	42	42	0.07	283	2.35
WG4D	West	O	D	Filtered	7.2	508	9	76	114	4.9	0.2 U	1 U	1 U	95	95	0.19	300	8.4
Average					7.3	554	8.7	80	132.5 J	6.7	0.3	0.1	0.1	79	79	0.35	320	5.35
Influent					7.1	589	8.8	87	142 J	10.5	0.4	0.1	0.1	90	90	0.58	348	5.33
Effluent					7.5	519	8.7	74	123 J	2.8	0.1	0.1	0.1	69	69	0.13	292	5.38

Note: When compound was undetected, as indicated by a U, detection limit was shown, but default value of 0.1 ug/l was used in calculations.

TABLE VI-IND: RESULTS OF ANALYSES OF SAMPLES COLLECTED MARCH 2000

Well	Gate	Loc	Depth	Type	pH	Spec Cond uS/cm	Temp C	ORP mV	Chloride mg/l	Sulfate mg/l	Nitrate N as N mg/l	Hydroxide alkalinity mg/l	Carbonate alkalinity mg/l	Bicar-bonate alkalinity mg/l	Total alkalinity mg/l	Total Phosphate as P mg/l	Total Dissolved Solids mg/l	Dissolved Oxygen mg/l
AG01D	A	I	D	Filtered	7.06	499	4.7	93	132	7.3	0.7	1 U	1 U	38	38	0.38	314	3.45
AG02S	A	I	S	Filtered	7.13	364	4.2	-36	70.7	1.1	0.2 U	1 U	1 U	44	44	0.55	209	0.45
AG03D	A	O	D	Filtered	7.06	434	5.7	-108	109	1.2	0.2 U	1 U	1 U	31	31	0.42	280	1.4
AG04S	A	O	S	Filtered	7.03	421	5	-37	35.5	0.6	0.2 U	1 U	1 U	121	121	5.3	269	0.6
AG05S	A	I	S	Filtered	7.45	197	3.7	211	7.6	11.3	0.3	1 U	1 U	38	38	2.7	96	3.4
AG06D	A	I	D	Filtered	8.95	198	4.1	128	24.6	14.9	1.8	1 U	1 U	43	43	2	144	5.95
AG07S	A	O	S	Filtered	6.92	86	3.6	-447	8	2.2	0.2 U	1 U	4	14	18	0.61	77	1.15
AG08D	A	O	D	Filtered	9.08	127	4	-331	20.6	1.2	0.2 U	1 U	1 U	34	34	0.46	103	1.45
AG09D	A	I	D	Filtered	8.5	260	4.2	152	30.4	13.6	0.9	1 U	1 U	34	34	0.64	148	1.95
AG10S	A	I	S	Filtered	8.45	255	3.2	9	11.3	5.3	0.2 U	1 U	1 U	86	86	3.4	182	2.6
AG11S	A	O	S	Filtered	8.59	170	3.8	-311	15	2.3	0.2 U	1 U	1 U	22	22	0.55	86	1.6
AG12D	A	O	D	Filtered	8.9	98	4.1	-112	13.8	6.1	0.2 U	1 U	6	6	12	0.41	81	9.55
Average					7.9	259	4.2	-66	39.9	5.6	0.4	0.1	0.9	43	43	1.45	166	2.8
Influent					7.9	296	4	93	46.1	8.9	0.7	0.1	0.1	47	47	1.61	182	2.97
Effluent					7.9	223	4.4	-224	33.7	2.3	0.1	0.1	1.7	38	40	1.29	149	2.63
DG1D	D	I	D	Filtered	8.93	283	7	128	18.2	10	0.2 U	1 U	1 U	116	116	0.13	193	10.65
DG2S	D	I	S	Filtered	8.84	273	5.5	109	33.4	6	0.2 U	1 U	1 U	59	59	0.18	181	3.6
DG3S	D	O	S	Filtered	9.09	223	5.1	-62	21.4	2	0.2 U	1 U	1 U	62	62	0.45	133	0.75
DG4D	D	O	D	Filtered	8.36	199	6.4	55	14.9	7.5	0.2 U	1 U	1 U	88	88	0.82	174	8.2
Average					8.8	245	6	58	22	6.4	0.1	0.1	0.1	81	81	0.4	170	5.8
Influent					8.9	278	6.3	119	25.8	8	0.1	0.1	0.1	88	88	0.16	187	7.13
Effluent					8.7	211	5.8	-4	18.2	4.8	0.1	0.1	0.1	75	75	0.64	154	4.48
EG1S	E	I	S	Filtered	8.07	372	5.3	45	31.3	11.8	0.2	1 U	1 U	84	84	4.7	194	2.8
EG2D	E	I	D	Filtered	8.04	363	7.3	70	31.7	3.7	0.2 U	1 U	1 U	140	140	6.2	227	4.25
EG3S	E	O	S	Filtered	8.24	270	6.6	-173	30.3	0.2 U	0.2 U	1 U	1 U	60	60	0.28	167	0.6
EG4D	E	O	D	Filtered	8.01	268	7.3	17	49.3	0.9	0.2 U	1 U	1 U	65	65	0.53	233	7
Average					8.1	318	6.6	-10	35.7	4.2	0.1	0.1	0.1	87	87	2.93	205	3.66
Influent					8.1	368	6.3	58	31.5	7.8	0.2	0.1	0.1	112	112	5.45	211	3.53
Effluent					8.1	269	7	-78	39.8	0.6	0.1	0.1	0.1	63	63	0.41	200	3.8
WG1D	West	I	D	Filtered	7.9	588	5.9	96	66.7	13.8	0.6	1 U	1 U	128	128	0.23	279	3.8
WG2S	West	I	S	Filtered	7.47	497	4.8	-24	52.9	9.6	0.5	1 U	1 U	112	112	0.6	265	0.8
WG3S	West	O	S	Filtered	7.9	347	5.1	-10	47.1	9.3	0.2 U	1 U	1 U	68	68	0.43	182	0.95
WG4D	West	O	D	Filtered	7.24	368	5.1	84	29.3	8.8	0.2 U	1 U	1 U	104	104	0.57	245	6.55
Average					7.6	450	5.2	37	49	10.4	0.3	0.1	0.1	103	103	0.46	243	3.03
Influent					7.7	543	5.4	36	59.8	11.7	0.6	0.1	0.1	120	120	0.42	272	2.3
Effluent					7.6	358	5.1	37	38.2	9.1	0.1	0.1	0.1	86	86	0.5	214	3.75

Note: When compound was undetected, as indicated by a U, detection limit was shown, but default value of 0.1 ug/l was used in calculations.

TABLE VII-IND: RESULTS OF ANALYSES OF SAMPLES COLLECTED JUNE 2000

Well	Gate	Loc	Depth	Type	pH	Spec Cond uS/cm	Temp C	ORP mV	Chloride mg/l	Sulfate mg/l	Nitrate N as N mg/l	Hydroxide alkalinity mg/l	Carbonate alkalinity mg/l	Bicar-bonate alkalinity mg/l	Total alkalinity mg/l	Total Phosphate as P mg/l	Total Dissolved Solids mg/l	Dissolved Oxygen mg/l
AG01D	A	I	D	Filtered	6.55	390	16	81	93.7	8.5	1.0 <	1 <	1	37	37	0.07	212	4.3
AG02S	A	I	S	Filtered	6.70	267	14.5	-102	29	0.6 <	0.2 <	1 <	1	53	53	0.52	95	0.2
AG03D	A	O	D	Filtered	6.80	396	13	-133	88.2	0.5 <	0.2 <	1 <	1	56	56	0.35	198	1.3
AG04S	A	O	S	Filtered	6.79	409	14	-79	41.9	1.3 <	0.2 <	1 <	1	90	90	0.53	[illegible]	0.8
AG05S	A	I	S	Filtered	6.64	247	15.4	133	47.4	8.6	1.5 <	1 <	1	36	36	0.59	[illegible]	2.3
AG06D	A	I	D	Filtered	6.58	348	12.1	139	63.3	13.4	3.7 <	1 <	1	42	42	0.49	193	2.6
AG07S	A	O	S	Filtered	8.46	182	15.3	-277	36	0.3 <	0.2 <	1	4	26	30	0.26	94	1.3
AG08D	A	O	D	Filtered	8.67	249	12	-248	48.8	1.0 <	0.2 <	1	4	38	42	0.54	131	1.9
AG09D	A	I	D	Filtered	6.78	173	16.1	146	10.6	7.9	0.2 <	1 <	1	24	24	0.14	65	3.0
AG10S	A	I	S	Filtered	6.79	230	16	-83	3.0	2.7 <	0.2 <	1 <	1	75	75	0.13	124	0.6
AG11S	A	O	S	Filtered	8.79	73	14.1	-240	5.2	0.7 <	0.2 <	1	4	17	21	0.69	51	2.3
AG12D	A	O	D	Filtered	8.37	114	12.7	-142	4.1	1.2 <	0.2 <	1	4	27	31	0.15	60	5.5
AG13D	A	O	D	Filtered	7.70	216	13.9	-368	44.2 <	0.2 <	0.2 <	1 <	1	48	48	0.67	115	1.3
Removal					-19%	15%	10%	506%	7%	89%	82%	NM	NM	3%	-2%	-41%	12%	5%
Influent					6.67	276	15	52	41	7.0	1.1	NM	NM	45	45	0.32	134	2.2
Effluent					7.94	234	14	-212	38	0.7	0.2	NM	NM	43	45	0.46	117	2.1
DG1D	D	I	D	Filtered	7.6	274	16	214	17.7	9.2 <	0.2 <	1 <	1	110	110	0.1	163	10.0
DG2S	D	I	S	Filtered	7.56	275	16	36	5.1	3.8 <	0.2 <	1 <	1	64	64	0.22	94	1.3
DG3S	D	O	S	Filtered	7.93	179	15.8	78	7.1	2.0 <	0.2 <	1 <	1	77	77	0.02	89	1.1
DG4D	D	O	D	Filtered	7.27	178	15.1	392	16.9	4.7 <	0.2 <	1 <	1	66	66	0.05	114	9.4
DG5D	D	O	D	Filtered	7.4	211	11.5	-103	13.0	8.8 <	0.2 <	1 <	1	388	388	0.03	165	2.9
DG6S	D	O	S	Filtered	8.32	129	16	-241	6.3	2.3 <	0.2 <	1 <	1	60	60	0.34	92	1.0
Removal					-2%	37%	9%	75%	5%	32%	NM	NM	NM	-70%	-70%	31%	11%	36%
Influent					7.58	275	16	125	11.4	6.5	NM	NM	NM	87	87	0.16	129	5.65
Effluent					7.73	174	15	32	10.8	4.5	NM	NM	NM	148	148	0.11	115	3.60
EG1S	E	I	S	Filtered	7.13	321	16.7	78	33.7	11.1	0.2 <	1 <	1	64	64	0.47	145	2.4
EG2D	E	I	D	Filtered	7.27	460	12.5	63	56.4	2.5 <	0.2 <	1 <	1	150	150	0.26	288	6.8
EG3S	E	O	S	Filtered	7.38	224	15.2	-223	35.1 <	0.2 <	0.2 <	1 <	1	54	54	0.08	127	1.7
EG4D	E	O	D	Filtered	7.27	264	13	62	58.0	0.6 <	0.2 <	1 <	1	44	44	0.35	216	6.6
Removal					-2%	38%	3%	214%	-3%	94%	NM	NM	NM	54%	54%	41%	21%	10%
Influent					7.20	391	14.6	71	45	6.8	NM	NM	NM	107	107	0	217	4.6
Effluent					7.33	244	14.1	-81	47	0.4	NM	NM	NM	49	49	0	172	4.2
WG1D	West	I	D	Filtered	6.83	466	15.2	56	81.1	10.9	0.2 <	1 <	1	40	40	0.07	196	3.8
WG2S	West	I	S	Filtered	6.87	370	15.3	-3	72.0	10.2 <	0.2 <	1 <	1	54	54	0.32	186	2.6
WG3S	West	O	S	Filtered	7.13	259	14.4	-41	46.8	0.4 <	0.2 <	1 <	1	51	51	0.42	139	1.4
WG4D	West	O	D	Filtered	7	296	12.8	4	46.6	5.9 <	0.2 <	1 <	1	90	90	0.34	224	7.2
Removal					-3%	34%	11%	170%	39%	70%	NM	NM	NM	-50%	-50%	-95%	5%	-34%
Influent					6.85	418	15.3	26.5	76.6	10.6	NM	NM	NM	47	47	0.20	191	3.2
Effluent					7.07	278	13.6	-18.5	46.7	3.15	NM	NM	NM	71	71	0.38	182	4.3

Note: When compound was undetected, as indicated by a U, detection limit was shown, but default value of 0.1 ug/l was used in calculations.
NM indicates calculation whose results would be Not Meaningful.

AG09D	A	I	D	Filtered	6.78	173	16.1	146	10.6	7.9	0.2 <	1 <	1	24	24	0.14	65	2.95
AG09DREI	A	I	D	Filtered					10.6	8.0	0.2 <	1 <	1	23	23	0.12	66	2.95
RPD									0%	1%	0%	0%	0%	4%	4%	15%	2%	0%
AG12D	A	O	D	Filtered	8.37	114	12.7	-142	4.1	1.2 <	0.2 <	1	4	27	31	0.15	60	5.45
AG12DRE	A	O	D	Filtered					4.1	1.2 <	0.2 <	1	4	27	31	0.14	60	4.65
RPD									0%	0%	0%	0%	0%	0%	0%	7%	0%	16%

TABLE VIII-IND: RESULTS OF ANALYSES OF SAMPLES COLLECTED SEPTEMBER 2000

Well	Gate	Loc	Depth	Type	pH	Spec Cond uS/cm	Temp C	ORP mV	Chloride mg/l	Sulfate mg/l	Nitrate N as N mg/l	Hydroxide alkalinity mg/l	Carbonate alkalinity mg/l	Bicarbonate alkalinity mg/l	Total alkalinity mg/l	Total Phosphate as P mg/l	Total Dissolved Solids mg/l	Dissolved Oxygen mg/l
Influent					7.44	279	15.9	5.3	35.6	10.4	1.1	1.0	1.0	43	43	0.32	109	2.2
Effluent					8.23	183	15.6	-195	35.2	0.9	0.2	1.0	1.8	36	37	0.32	104	1.7
DG1D	D	I	D	Filtered	8.19	165	16.7	-47	17.4	9.5 <	0.2 <	1 <	1	108	108	0.08	167	9.2
DG2S	D	I	S	Filtered	7.68	257	14.6	30	7.7	9.6 <	0.2 <	1 <	1	88	88	0.29	119	2.0
DG3S	D	O	S	Filtered	7.86	206	16.3	19	3.8	0.3 <	0.2 <	1 <	1	108	108	0.06	105	0.9
DG4D	D	O	D	Filtered	7.71	200	14.7	43	17.5	5.1 <	0.2 <	1 <	1	100	100	0.06	140	8.6
DG5D	D	O	D	Filtered	8.68	163	13.5	-36	12.2	0.5 <	0.2 <	1 <	1	108	108	0.21	132	0.9
DG6S	D	O	S	Filtered	8.58	99	16.6	10	4.5	0.3 <	0.2 <	1 <	1	48	48 <	0.01	94	2.3
Removal %					-5%	30%	5%	167%	9%	79%	0%	0%	0%	13%	13%	50%	15%	30%
Influent					7.94	221	15.7	-9	12.6	9.6	0.2	1.0	1.0	98	98	0.19	143	5.6
Effluent					8.32	154	14.9	6	11.4	2.0	0.2	1.0	1.0	85	85	0.09	122	3.9
EG1S	E	I	S	Filtered	6.54	232	15.1	13	28.9	11.4	0.4 <	1 <	1	76	76	0.1	152	2.3
EG2D	E	I	D	Filtered	6.35	384	12.6	44	56.6	2.0 <	0.2 <	1 <	1	156	156	0.66	257	5.4
EG3S	E	O	S	Filtered	7.32	209	15.6	-241	28.1 <	0.2 <	0.2 <	1 <	1	54	54	0.49	114	3.0
EG4D	E	O	D	Filtered	6.44	268	14.0	-13	66.3	0.6 <	0.2 <	1 <	1	50	50	0.49	191	7.3
Removal %					-7%	23%	-7%	546%	-10%	94%	33%	0%	0%	55%	55%	-29%	25%	-34%
Influent					6.45	308	13.9	29	42.8	6.7	0.3	1.0	1.0	116	116	0.38	205	3.9
Effluent					6.88	239	14.8	-127	47.2	0.4	0.2	1.0	1.0	52	52	0.49	153	5.2
WG1D	West	I	D	Filtered	7.15	315	12.4	14	57.4	10.2 <	0.2 <	1 <	1	84	84	0.38	535	3.6
WG2S	West	I	S	Filtered	7.55	318	17.4	NA	59.6	9.4 <	0.2 <	1 <	1	80	80	0.50	313	1.5
WG3S	West	O	S	Filtered	6.82	267	17.0	-57	55.2	1.0 <	0.2 <	1 <	1	50	50	0.59	684	1.1
WG4D	West	O	D	Filtered	6.89	349	18.0	20	49.4	8.7 <	0.2 <	1 <	1	124	124	7.9	202	7.1
Removal %					7%	3%	-17%	232%	11%	51%	0%	0%	0%	-6%	-6%	-865%	-4%	-61%
Influent					7.35	317	14.9	14	58.5	9.8	0.2	1.0	1.0	82	82	0.44	424	2.6
Effluent					6.86	308	17.5	-19	52.3	4.9	0.2	1.0	1.0	87	87	4.25	443	4.1

Note: When compound was undetected, as indicated by a U, detection limit was shown, but default value of 0.1 ug/l was used in calculations.

Base map from USGS Topographic Quad Maps:
Colchester (PR 1987), Vermont and
Burlington (PR 1972), Vermont

0 0.5 1.0

SCALE IN MILES

N

EMCON

DATE	JUNE [illegible]
DWN	JAM
APP	JJH
REV	BGS
PROJECT NO.	84740-025.000

FIGURE 1

HERCULES INCORPORATED
CHAMPLAIN CABLE CORPORATION SITE
COLCHESTER, VERMONT

SITE LOCATION

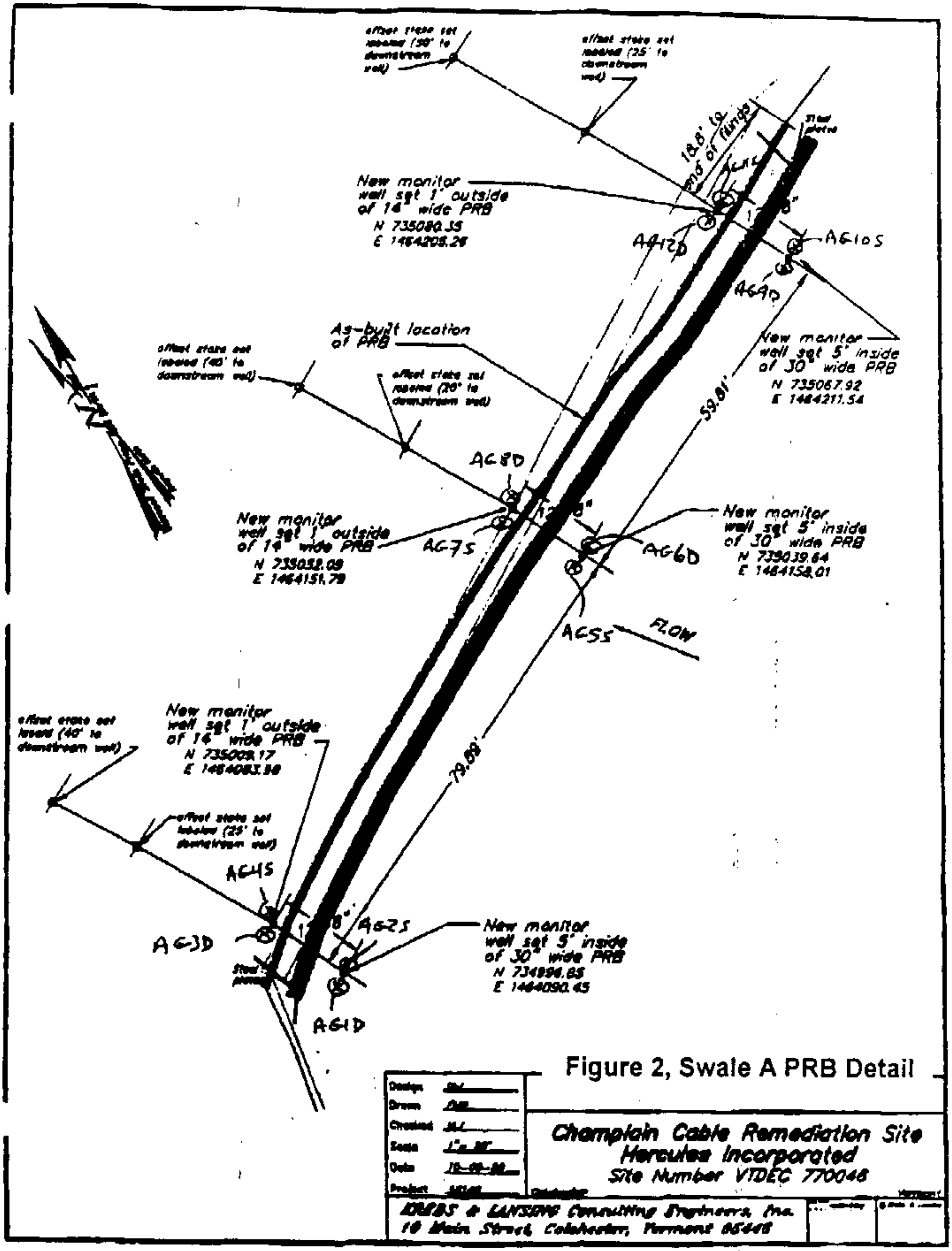

Figure 2, Swale A PRB Detail

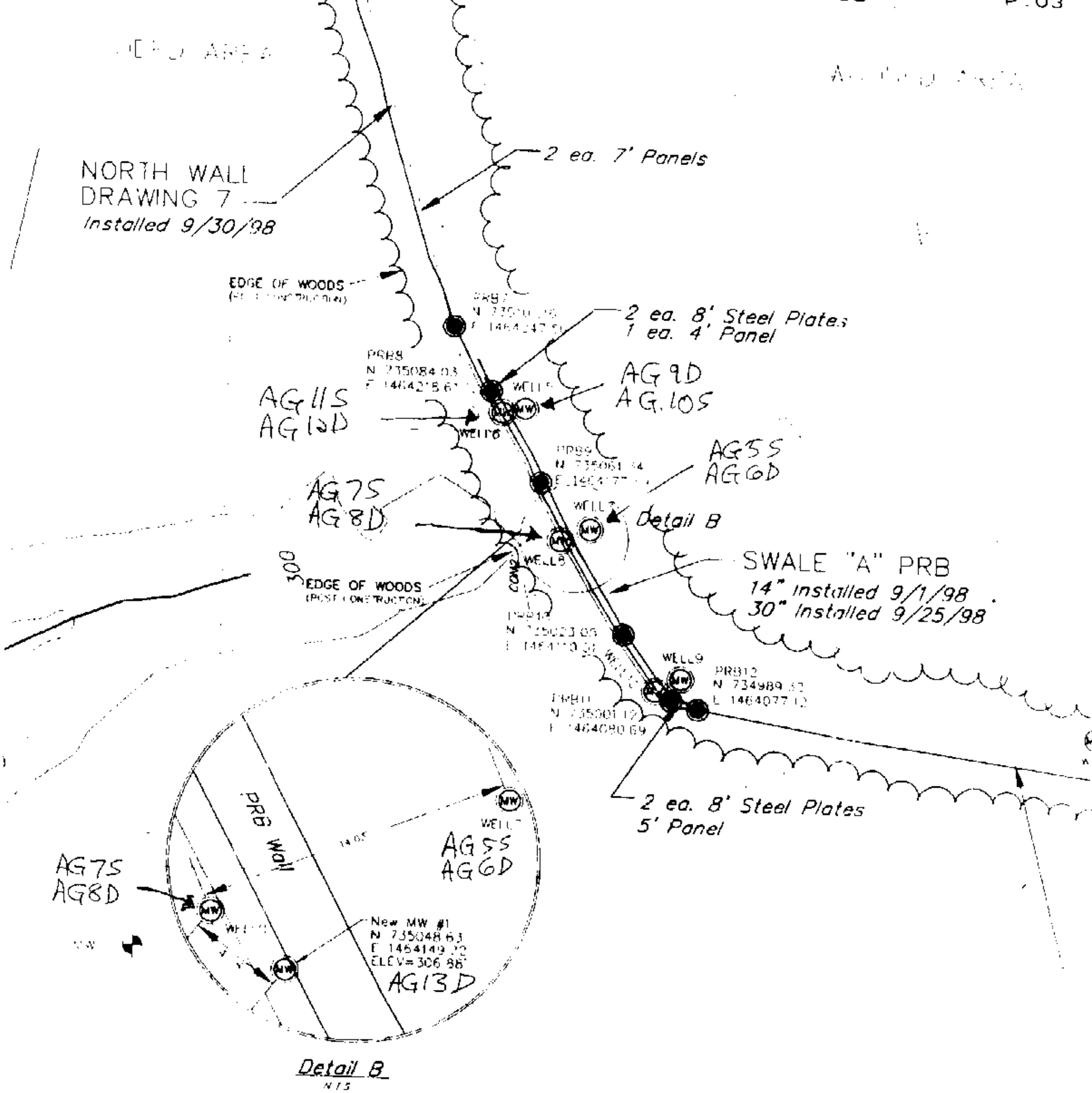

Figure 2A Swale A Additional well (AG13D)

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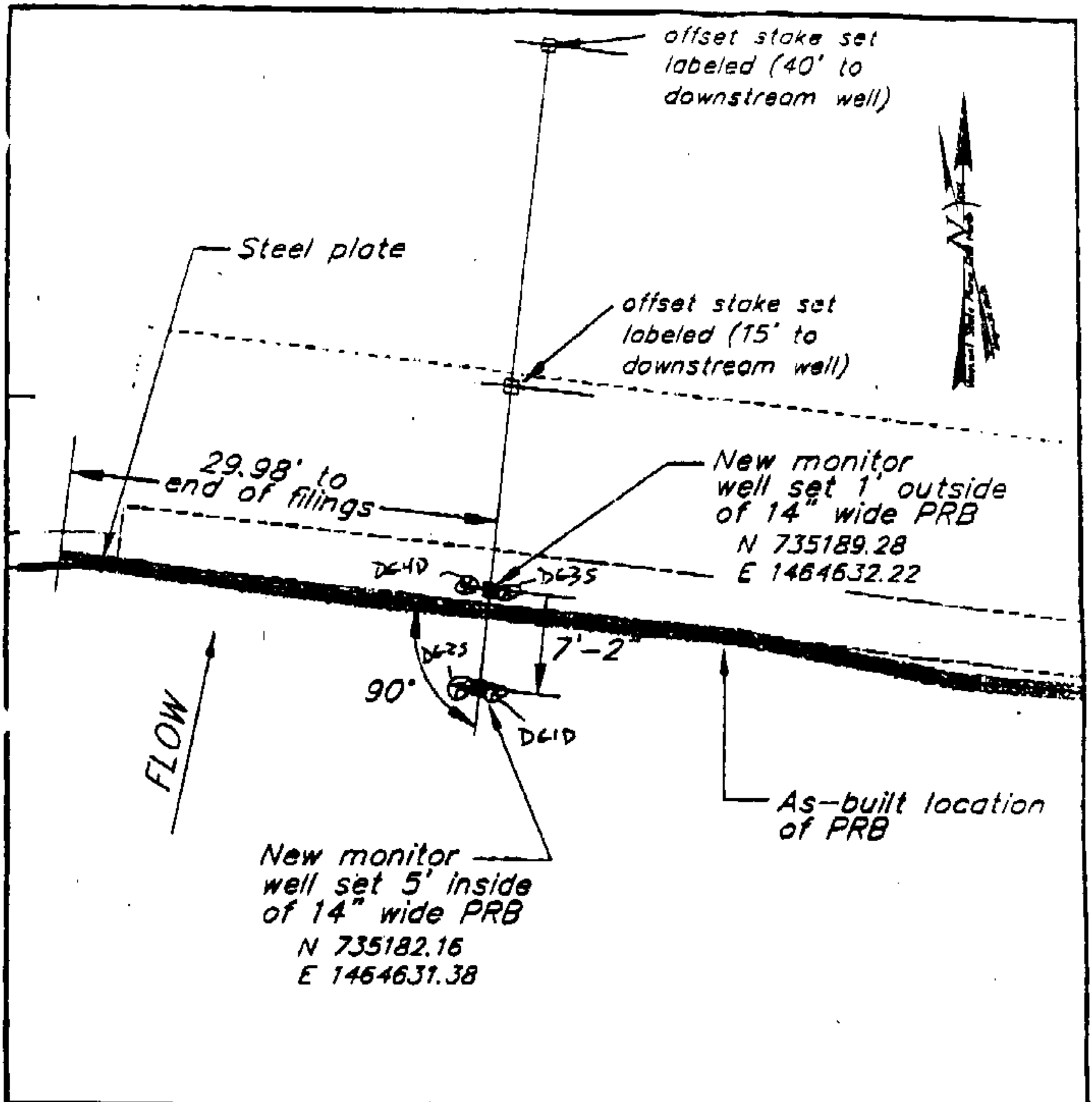

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Drawn	FMP
Checked	IAJ
Scale	1"= 10'
Date	10-09-98
Project	98148

Figure 3, Swale D PRB Detail

Champlain Cable Remediation Site
Hercules Incorporated
Site Number VTDEC 770046

Colchester Vermont

KREBS & LANSING Consulting Engineers, Inc.
10 Main Street, Colchester, Vermont 05446

© Krebs & Lansing

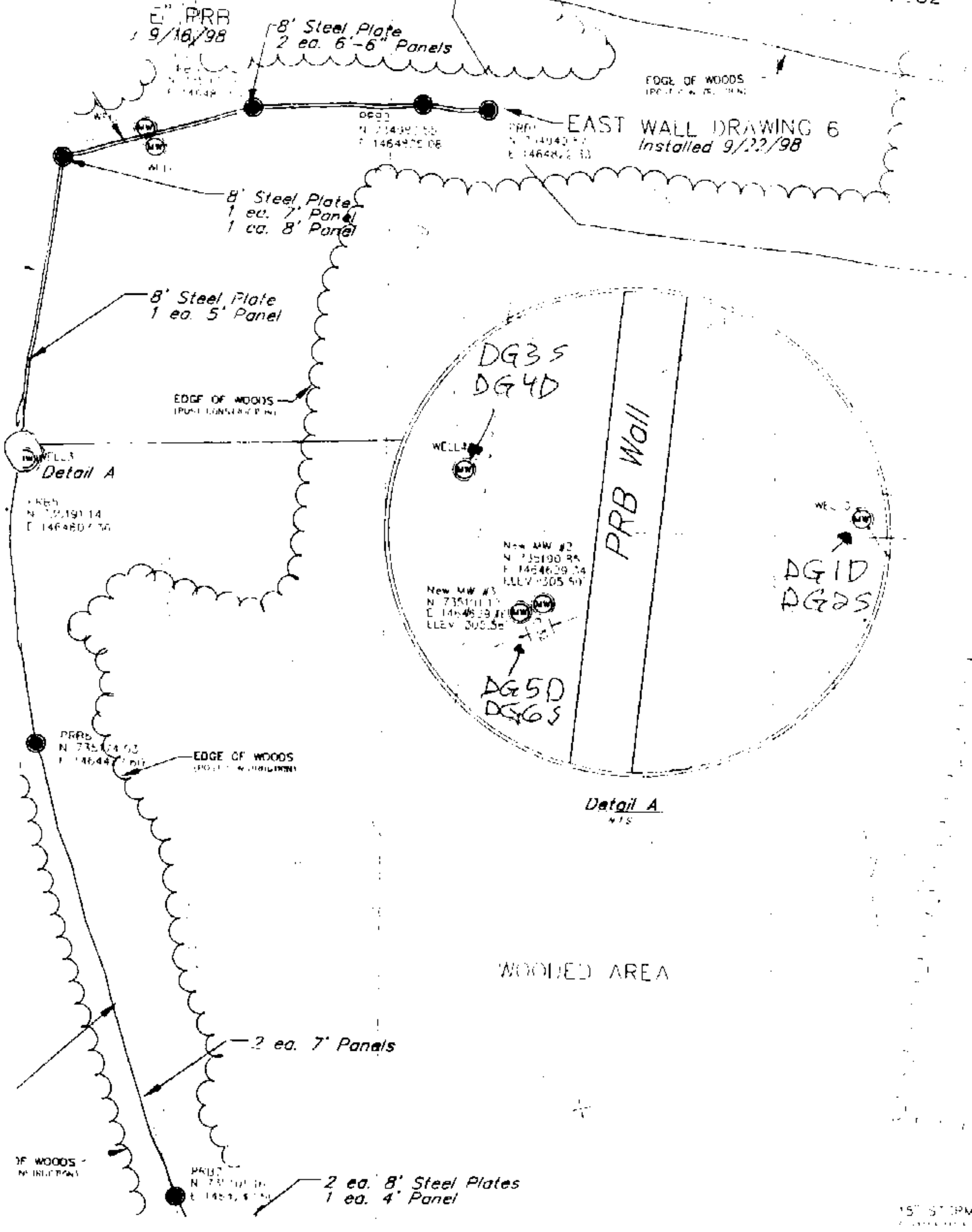
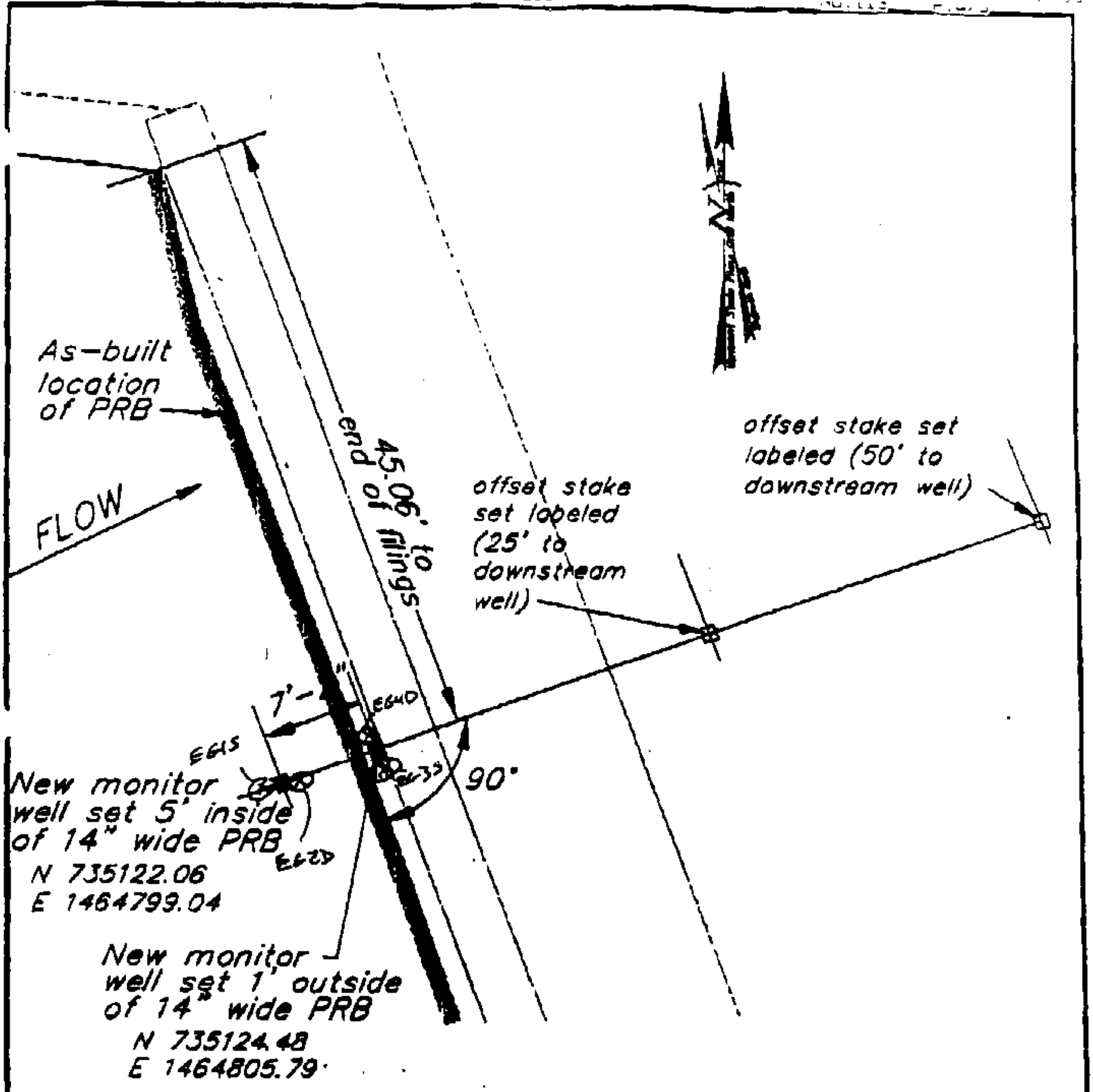


Figure 3A Swale D additional wells (DG5D and DG6S)



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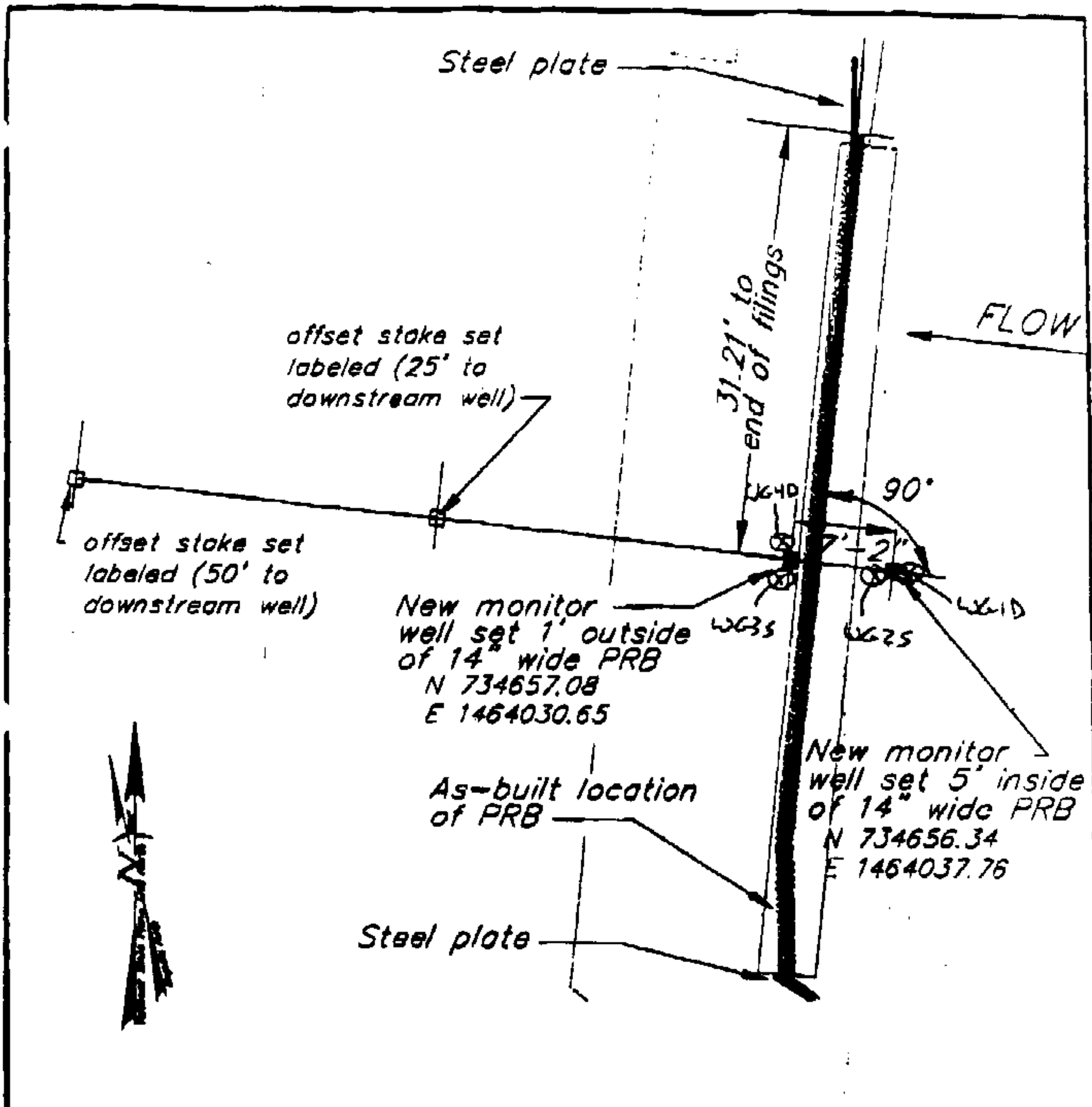
Drawn	PMP
Checked	IAJ
Scale	1" = 10'
Date	10-09-98
Project	98146

Figure 4, Swale E PRB Detail

Champlain Cable Remediation Site
Hercules Incorporated
Site Number VTDEC 770046

Colchester Vermont

KREBS & LANSING Consulting Engineers, Inc.
10 Main Street, Colchester, Vermont 05446



Design	IAJ
Drawn	FMP
Checked	IAJ
Scale	1" = 10'
Date	10-09-98
Project	98148

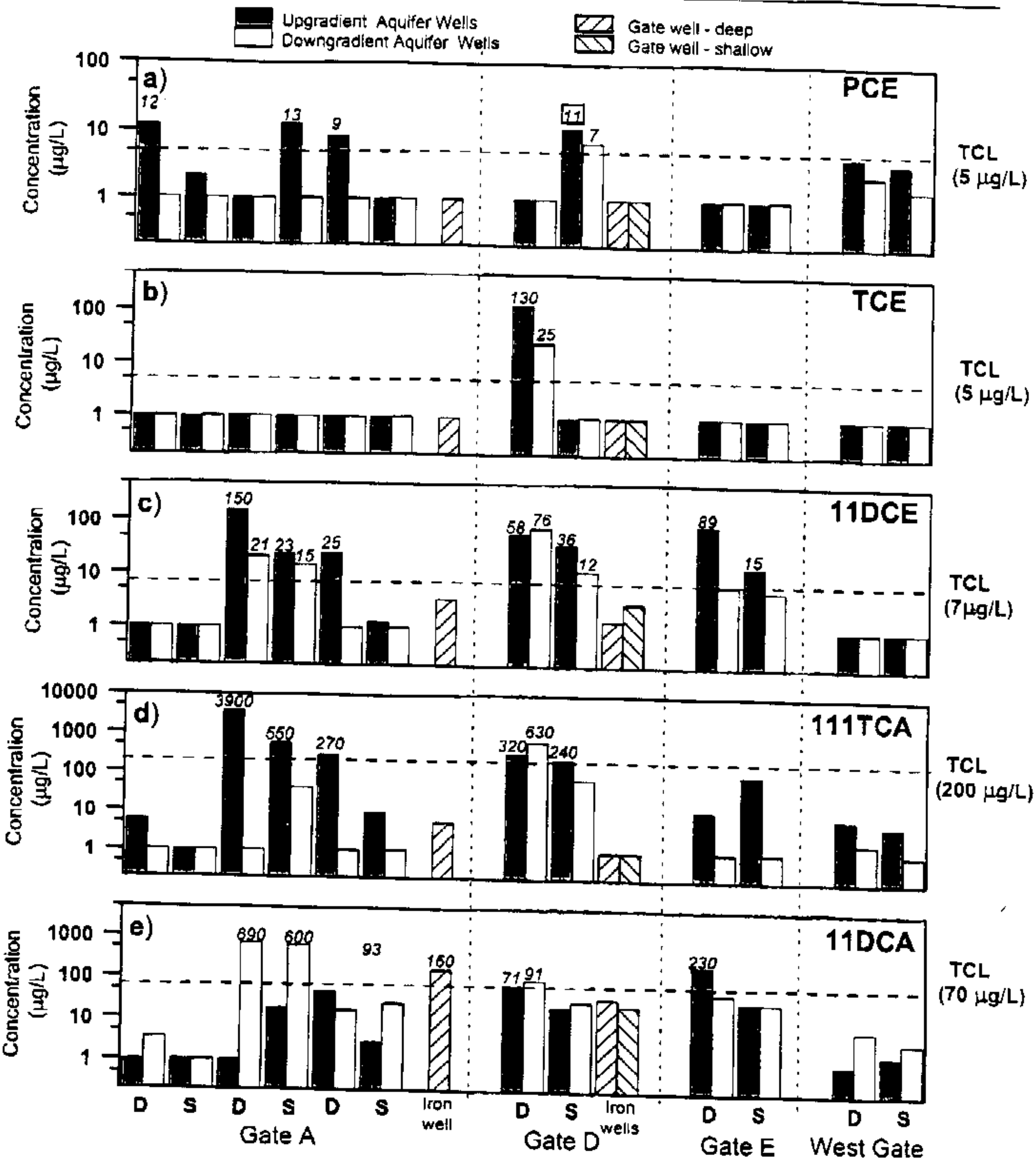
Figure 5, West PRB Detail

Champlain Cable Remediation Site
Hercules Incorporated
Site Number VTDEC 770046

Colchester Vermont

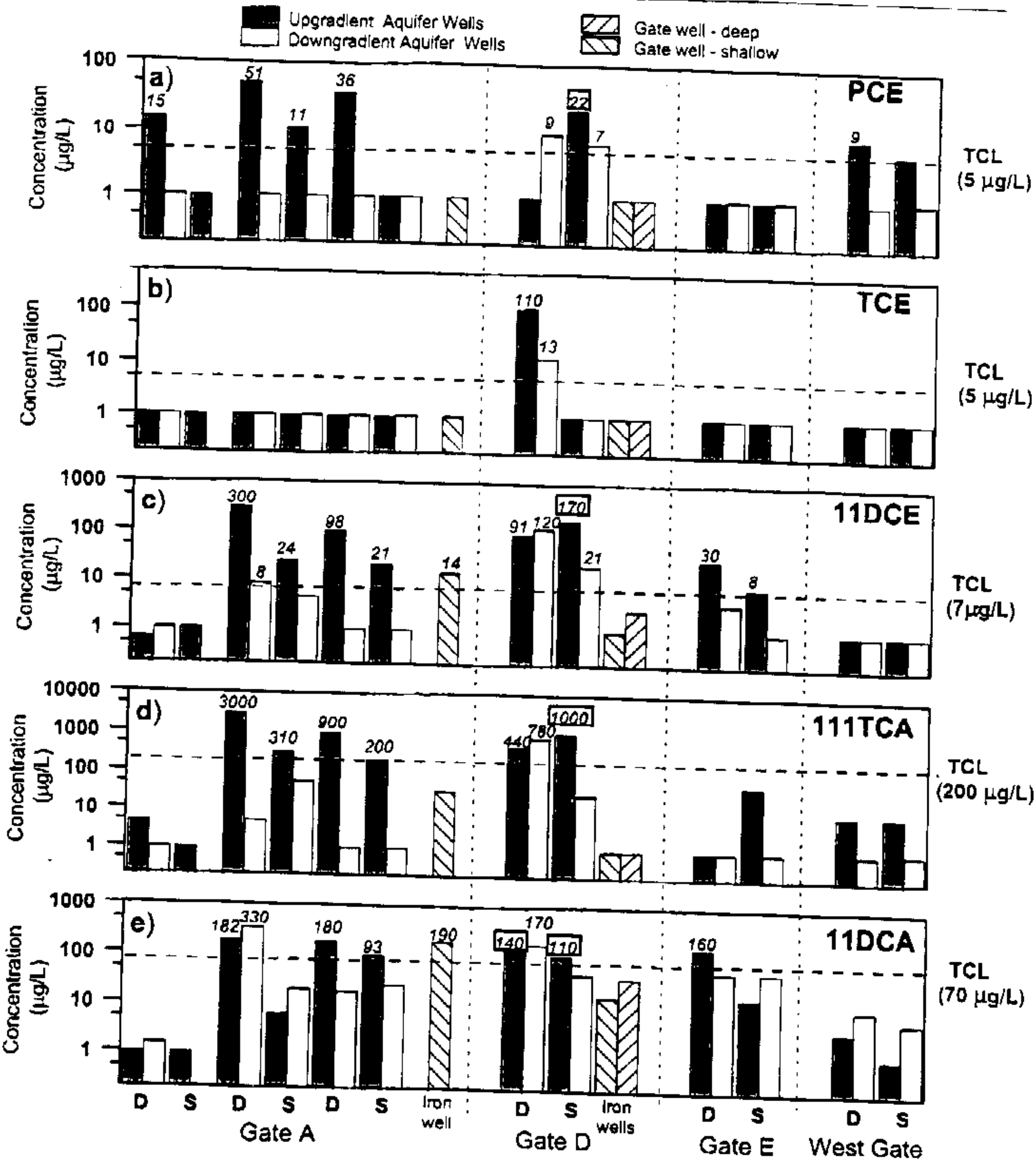
KREBS & LANSING Consulting Engineers, Inc.
10 Main Street, Colchester, Vermont 05446

enviro**metal** technologies inc.



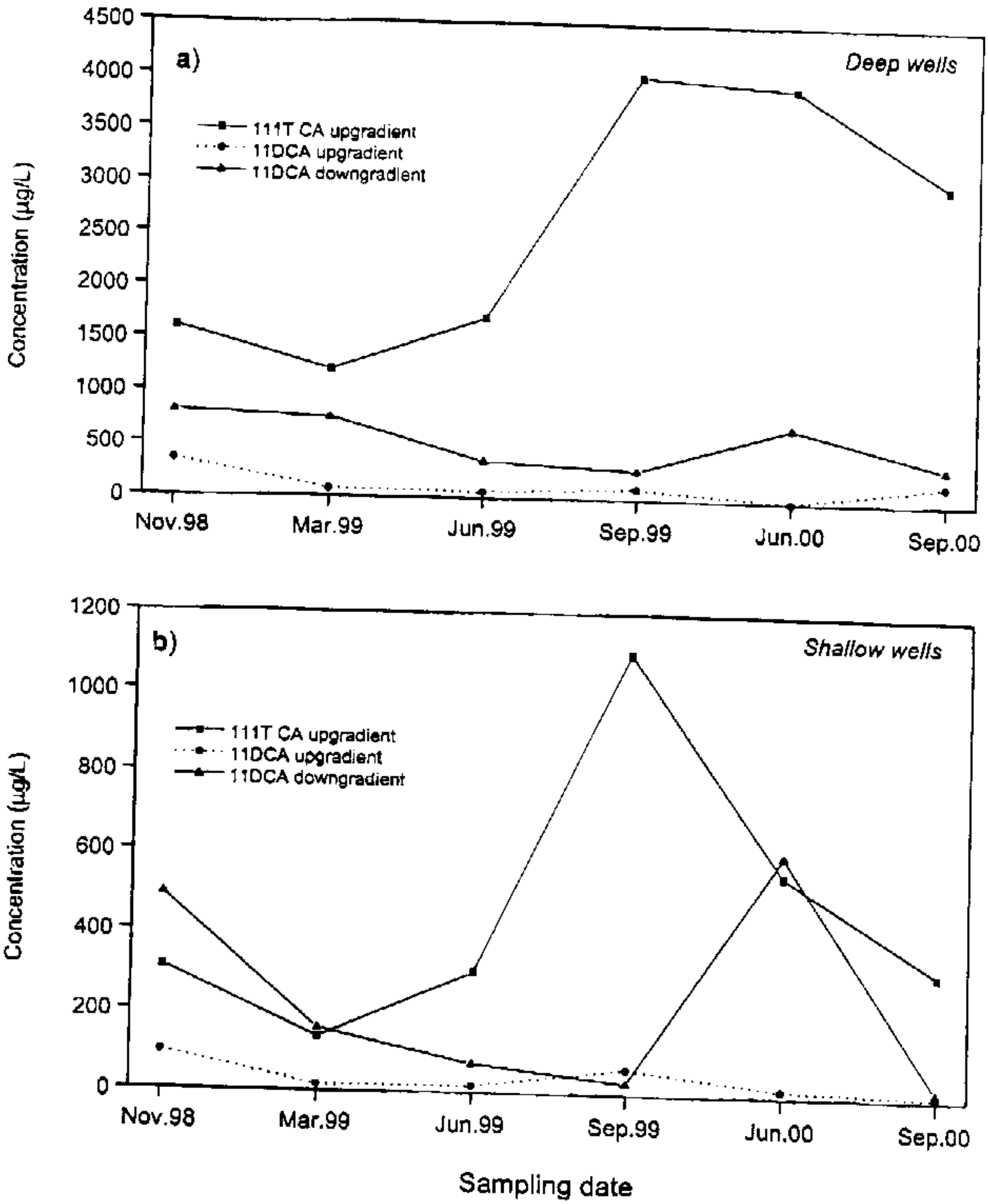
Concentrations of VOCs detected in June 2000 in groundwater monitoring wells located along the transects of four iron gates at the Champlain site, VT: a) PCE, b) TCE, c) 11DCE, d) 111TCA, and e) 11DCA. The target cleanup level (TLC) for each compound is indicated by the dashed lines. D - deep transect wells, S - shallow transect wells. Numerical values with a border indicate concentrations exceeding the maximum design values.

Figure 6 Concentrations of VOCs detected in June 2000



. Concentrations of VOCs detected in September 2000 in groundwater monitoring wells located along the transects of four iron gates at the Champlain site, VT: a) PCE, b) TCE, c) 11DCE, d) 111TCA, and e) 11DCA. The target cleanup level (TLC) for each compound is indicated by the dashed lines. D - deep transect wells, S - shallow transect wells. Numerical values with a border indicate concentrations exceeding the maximum design values.

Figure 7 Concentrations of VOCs detected in September 2000



Temporal variation of 111TCA and 11DCA concentrations along the middle well transect at Gate A: a) deep well transect; b) shallow well transect.

Figure 8 Temporal variation of 111TCA and 11DCA concentrations

APPENDIX A

ETI Letter of September 10, 1999

enviromettal technologies inc.

Memorandum

To: Glen H. Schmiesing, Hercules, Inc.

From: Andrzej Przepiora, John Vogan, EnviroMetal Technologies Inc.

Date: 10 September 1999

Re: **Comments on November 1998 - May 1999 Groundwater Monitoring Report, Champlain Cable Corporation Site, Colchester, VT – 31176.77**

In September 1998, an in-situ permeable reactive barrier (PRB) treatment system was installed at the Champlain Cable Corporation Site, Colchester, VT. The treatment system was installed in a funnel and gate configuration, whereby four permeable walls or gates (Gates A, D, E and West) with interconnected HDPE funnels treat CVOC impacted groundwater. EnviroMetal Technologies Inc. (ETI) has received from Hercules, Inc. a groundwater monitoring report that included monthly groundwater level measurements and semiannual (November 1998 and March 1999) concentrations of selected CVOCs. ETI's comments on the report are provided in this memorandum.

The monitoring well network for Gate A consists of 3 transects across the treatment system (the eastern, middle and western). For Gates D, E and W, one transect in the middle of the treatment system was monitored. Each transect consists of two pairs of wells completed in the deep (silt) and shallow (sand) part of the water table aquifer. The upgradient and downgradient wells are located 5 ft and 1 ft from the gates, respectively.

Groundwater flow through the gates

Table 1 shows the hydraulic head differences along the gate transects. Data for Gates A and W indicate flows through the treatment systems consistent with the previously determined groundwater flow direction. The hydraulic head difference along the deep transect in Gate D for May 1999 (1.43 ft) was 3-fold higher then the highest value measured over the 7-month period in this transect (Table 1). This reading appears anomalous when compared with the water level fluctuation in other deep well transects at the site. Also, the groundwater levels in the Gate D deep-well transect indicate a reversed hydraulic gradient in November 1998 and March 1999 (Table 1). Reversed hydraulic gradients were also observed in the Gate E deep-

745 Bridge St. W., Suite 7
Waterloo, Ontario
Canada N2V 2G6
Tel: (519) 746-2204
Fax: (519) 746-2209

well transect during the November, January, April and May monitoring (Table 1). A surveying mistake is probably not the reason for the reversed hydraulic gradients at Gates D and E, because these anomalous gradients were recorded intermittently in the 7-month monitoring period. Figures 1 and 2 show groundwater elevation fluctuations in the transect wells in Gates D and E. Assuming that water level fluctuations in both shallow and deep groundwater wells were similar, as seen for Gate W (Figure 3) and A (not graphed), it can be concluded that wells DG1D (Gate D) and EG4D (Gate E) display a lag in response to surface recharge. Change in water chemistry from upgradient to downgradient wells (e.g.; decreased VOCs, D.O. and alkalinity, increased pH - Figures 6 and 7) along these questionable transects further supports the hypothesis that the groundwater flows through the systems as intended. Since Gates D and E are monitored by two well transects at one location only, ETI suggests that wells DG1D and EG2D be redeveloped, in hope that well redevelopment will provide additional information on groundwater movement through these gates.

Based on the measured hydraulic gradients and the hydraulic conductivities from tracer tests (CAP, 1998), groundwater velocities were estimated (Table 2). The estimated values are significantly higher (up to 50-fold higher in the deep aquifer and up to 15-fold higher in the shallow aquifer) than the previously reported velocities estimated based on the water balance at the site (CAP, 1998). It may beneficial to measure the groundwater velocities at the site using a field flow meter. The residence times in the deep part of the aquifer appear equal or higher than the design residence times for all gates (Table 2). In gates A and W the residence times in the shallow aquifer appear to be lower than the design values.

VOC concentrations

Table 2 indicates the number of pore volumes (PV) that had passed through the systems at the times of VOC sampling. It has been ETI's experience that a steady state (i.e. the optimal removal efficiency) is usually established in the iron system after about 40 PV. By April 1999, a the number of pore volumes that had passed through the gate was less than 20 in the shallow well transects in Gates D, E and W (Table 2).

The VOC data interpretation included in the Hercules monitoring report was based on the laboratory data from Severn Trent Laboratories (Report's Tables III and VI). The concentrations flagged "U" are reported as half the detection limit, but were really not detected. In ETI's opinion, considering those values to determine the iron system efficiency is misleading. For example, the concentrations of both PCE and TCE flagged "U" were reported in the range from 0.5 to 100 μg/L, whereas the VTS for those compounds is 5 μg/L. For ETI's interpretation of the VOC data at the site, the concentrations flagged "U" were treated as non detects (Figures 4 and 5).

Figures 4 and 5 show the concentration profiles along well transects as detected in November 1998 and March 1999. The concentration of PCE, TCE, 11DCE and 111TCA were lowered along all gate transects monitored. The highest VOC concentrations were treated in Gate A, the thickest wall in the system (44 in. of the total iron thickness, as compared to 14 in. of total iron thickness in Gates D, E and W). For example, in November 1998 the upgradient 111TCA concentrations ranged from 5 to 1,600 μg/L in the transects through Gate A (Figure 4). The 111TCA concentrations in the downgradient wells were 3.4 μg/L or less. For the same gate in November 1998, the 11DCE in the upgradient wells ranged form 170 to 38 μg/L and declined to no-detect values in the downgradient wells. The highest influent VOC concentrations were measured in the middle and east well transects. All influent VOC concentrations in the west upgradient wells of Gate A were below the VTS for both sampling events.

VOC removal in Gates D and E was less pronounced. For example, in November 1998 the TCE in the upgradient deep well in Gate D was detected at 120 μg/L and declined to 85 μg/L. For Gate D in March 1999, the 11DCE concentrations were reduced from 46 and 120 μg/L to 24 and 11 μg/L in the deep and shallow transects, respectively. It must be noted that, as of March 1999, only 1 and 15 pore volumes had passed trough the deep and shallow parts of the system in Gate D, respectively (Table 2).

Downgradient levels of 11DCA increased relative to the upgradient wells along most Gate A transects. This could be due to production of 11DCA from dechlorination of 111TCA, since 11DCA accounts for about 40% of 111TCA break-down products. As indicated by ETI in the design stages of the iron PRB system, the iron does not degrade 11DCA at rapid rates. The increase in 11DCA concentration in the downgradient wells may also reflect desorption of the compound from aquifer material. Levels of 11DCA either decreased or remained essentially unchanged after passing Gates D, E and W.

The inorganic parameter profiles are presented in Figures 6 and 7. The change in water chemistry along the well transects reflects the expected effects of the iron-enhanced process.

Summary

The groundwater levels indicate a consistent flow through the PRB iron walls. Two deep monitoring wells (DG1D and EG4D) appear to show anomalous readings. It is recommended that these wells be redeveloped.

The laboratory report for VOC concentrations in groundwater did not provide, for the most part, a high enough resolution for a precise assessment of the entire system's performance. Based on the available analytical data, the concentration of PCE, TCE, 11DCE and 111TCA were reduced by the iron in all four gates. The reduction in concentration was the highest in Gate A. The concentrations of 11DCA as yet show no appreciable change, which was predicted and indicated by ETI in the design stages.

Table 1. Head differences in the transect wells.

Location	Transect wells	In - out head difference in the transects								Avg. hydraulic gradient[b]
		Nov. 98	Dec. 98	Jan. 99	Feb.99	March 99	Apr. 99	May 99	Average[a]	
Gate A	AG1D → AG3D	0.97	0.82	0.83	0.86	1.03	1.09	1.06	0.95	0.074
	AG2S → AG4S	0.81	0.66	0.63	0.66	0.8	0.83	0.79	0.74	0.058
	AG6D → AG8D	1.08	0.92	0.9	0.98	1.66	1.42	1.28	1.18	0.092
	AG5S → AG7S	1.07	0.91	0.89	0.99	1.19	1.41	1.25	1.10	0.085
	AG9D → AG12D	1.01	0.76	0.68	_	1.24	1.13	0.98	0.97	0.075
	AG10S → AG11S	1.01	0.76	0.75	_	0.88	1.19	0.99	0.93	0.073
Gate D	DG1D → DG4D	-0.13	0.39	0.29	0.2	-0.16	0.36	1.43	0.34 (0.31)	0.043
	DG2S → DG3S	0.16	0.17	0.12	0.29	0.25	0.2	0.14	0.19	0.063
Gate E	EG2D → EG4D	-0.56	0.66	-0.4	0.62	0.3	-1.61	-0.24	-0.18 (0.52)	0.072
	EG1S → EB3S	0.47	0.38	0.43	0.39	-0.02	0.58	0.51	0.39 (0.46)	0.063
Gate W	WG1D → WG4D	0.74	0.51	0.43	_	0.6	1.26	0.63	0.70	0.097
	WG2S → WG3S	0.7	0.49	0.41	_	0.59	0.71	0.65	0.59	0.082

[a] Values in parenthesis indicate averages calculated without the negative values.

[b] Measurements with a negative gradient values were not considered for the average

Table 2. Parameters for groundwater movement through the gates.

Location	Well completion	GW velocity from hydraulic gradients[a] (ft/d)	GW velocity from water balance (CAP, 1998) (ft/d)	Residence time in constructed gates[b] (days)	Design residence time (100% iron)[c] (days)	Number of pore volumes passed through the gates	
						November 98	March 99
Gate A	Deep	2.18	0.04	1.5 - 83	1.9	0.4 - 20	2 - 100
	Shallow	10.4	0.69	0.3 - 4.8	4.6	6.3 - 94	20 - 470
Gate D	Deep	0.08	0.004	4.4 - 88	3.1	0.1 - 2	0.5 - 10
	Shallow	0.78	0.07	0.5 - 5	2.7	2 - 20	9 - 100
Gate E	Deep	0.14	0.01	8.6 - 120	1.3	0.3 - 4	1.5 - 20
	Shallow	1.72	0.50	0.7 - 2.4	NTR	12.5 - 43	63 - 250
Gate W	Deep	0.19	0.03	3.1 - 19.3	6.9	1 - 5	5 - 20
	Shallow	2.23	0.48	0.3 - 1.2	6.9	12 - 56	60 - 280

[a] Hydraulic conductivities averaged from tracer tests as reported in CAP, 1998 (Tables 6 and 7, vol. 1), effective porosity of 0.4 assumed

[b] Adjusted for 100% iron where an iron/sand mixture was used (Gate A - 30 in. of 100% iron and 14 in. of 70% iron, Gate D - 14 in. of 30% iron, Gate E - 14 in. of 100% iron, Gate W - 14 in. of 50% iron), ranges for two velocities in the previous two columns

[c] As reported in the CAP, 1998 (Apendix C, Tables II to IX, vol. 1)

[d] Between transect wells, based on the groundwater velocities as in [a]

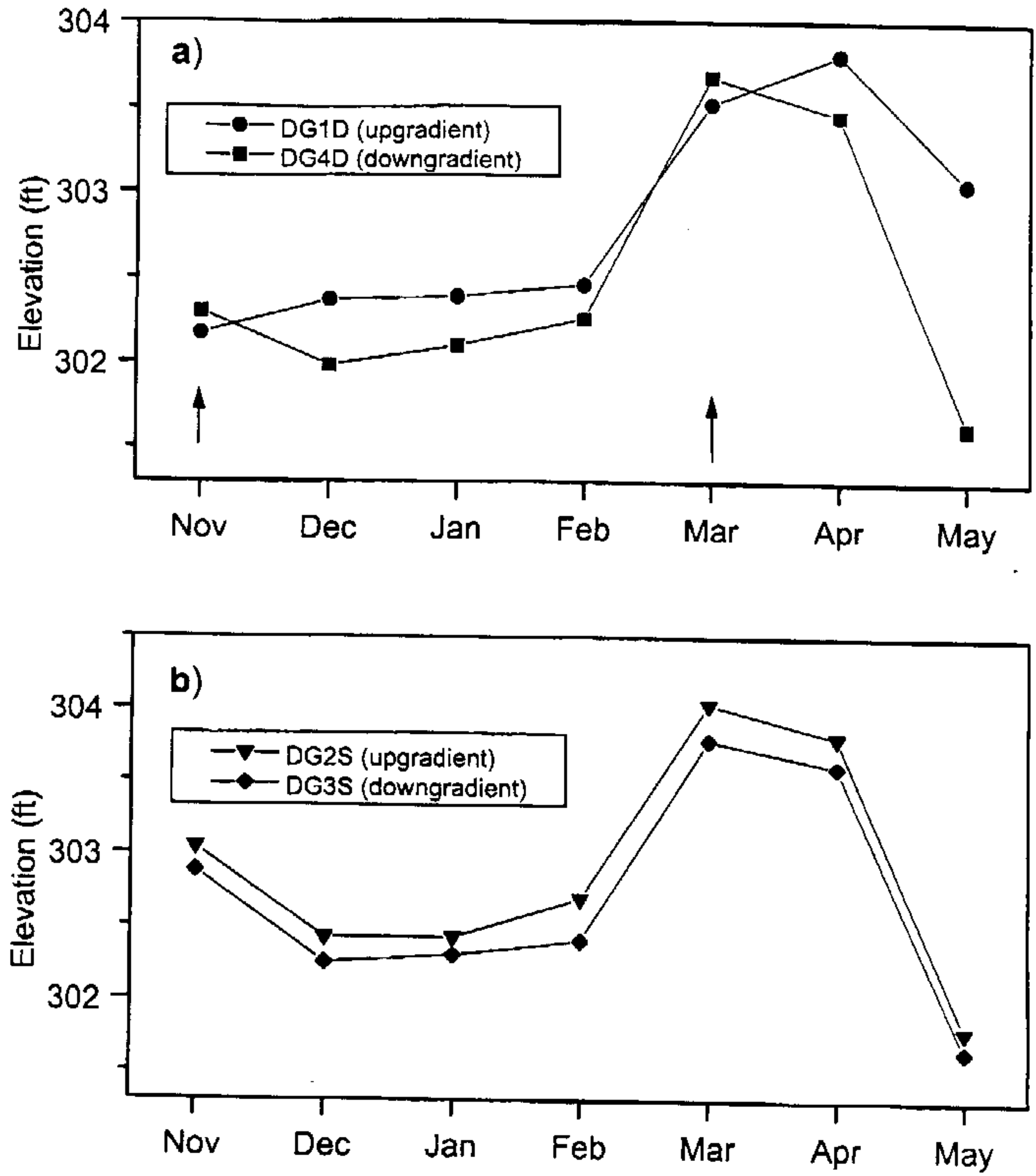


Figure 1. Measured groundwater water elevations in monitoring wells located on the upgradient and downgradient side of Gate D: a) deep wells, b) shallow wells. The arrows indicate occurrences of a reversed hydraulic gradient along the well transects.

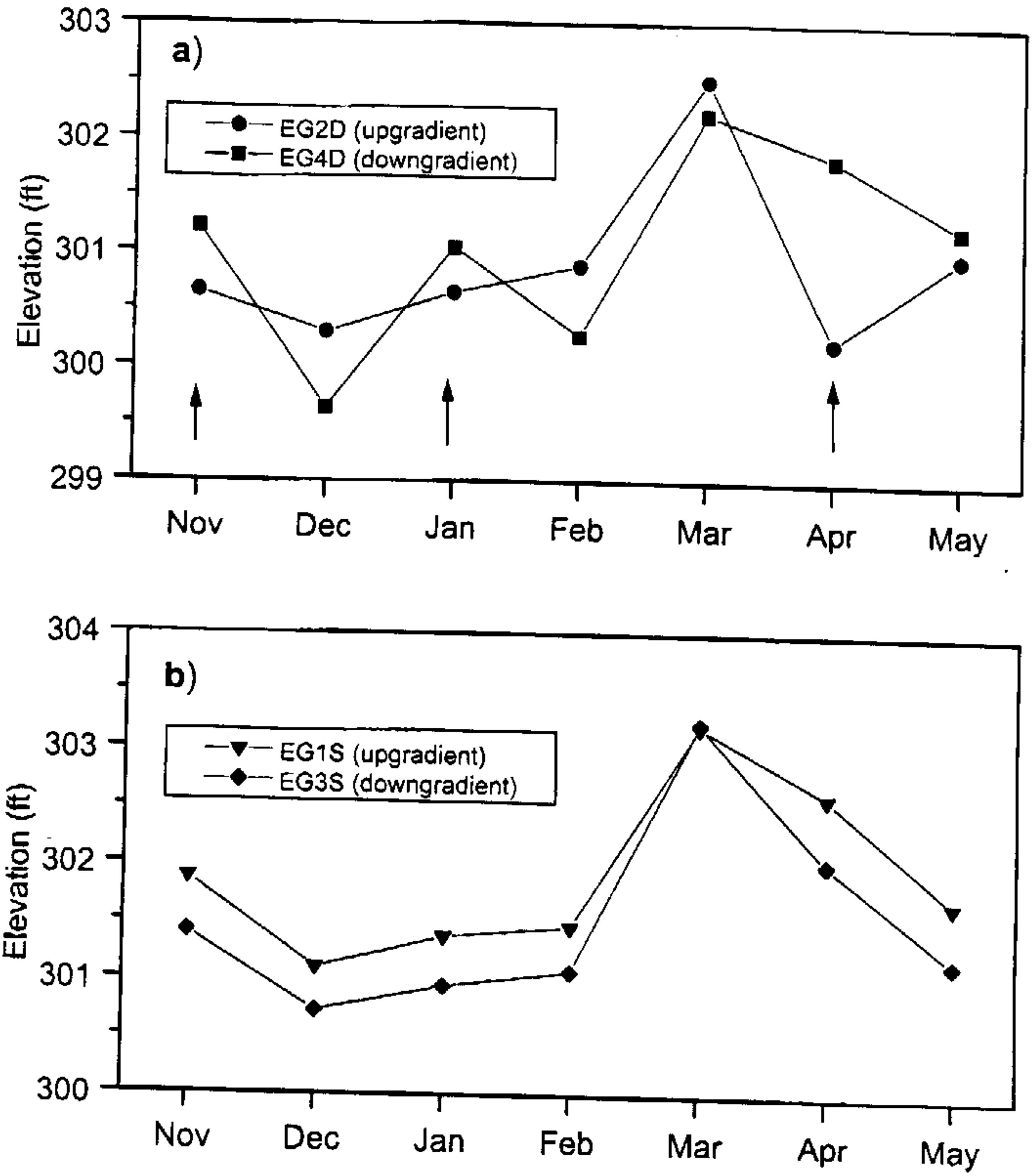


Figure 2. Measured groundwater water elevations in monitoring wells located on the upgradient and downgradient side of Gate E: a) deep wells, b) shallow wells. The arrows indicate occurrences of a reversed hydraulic gradient along the well transects.

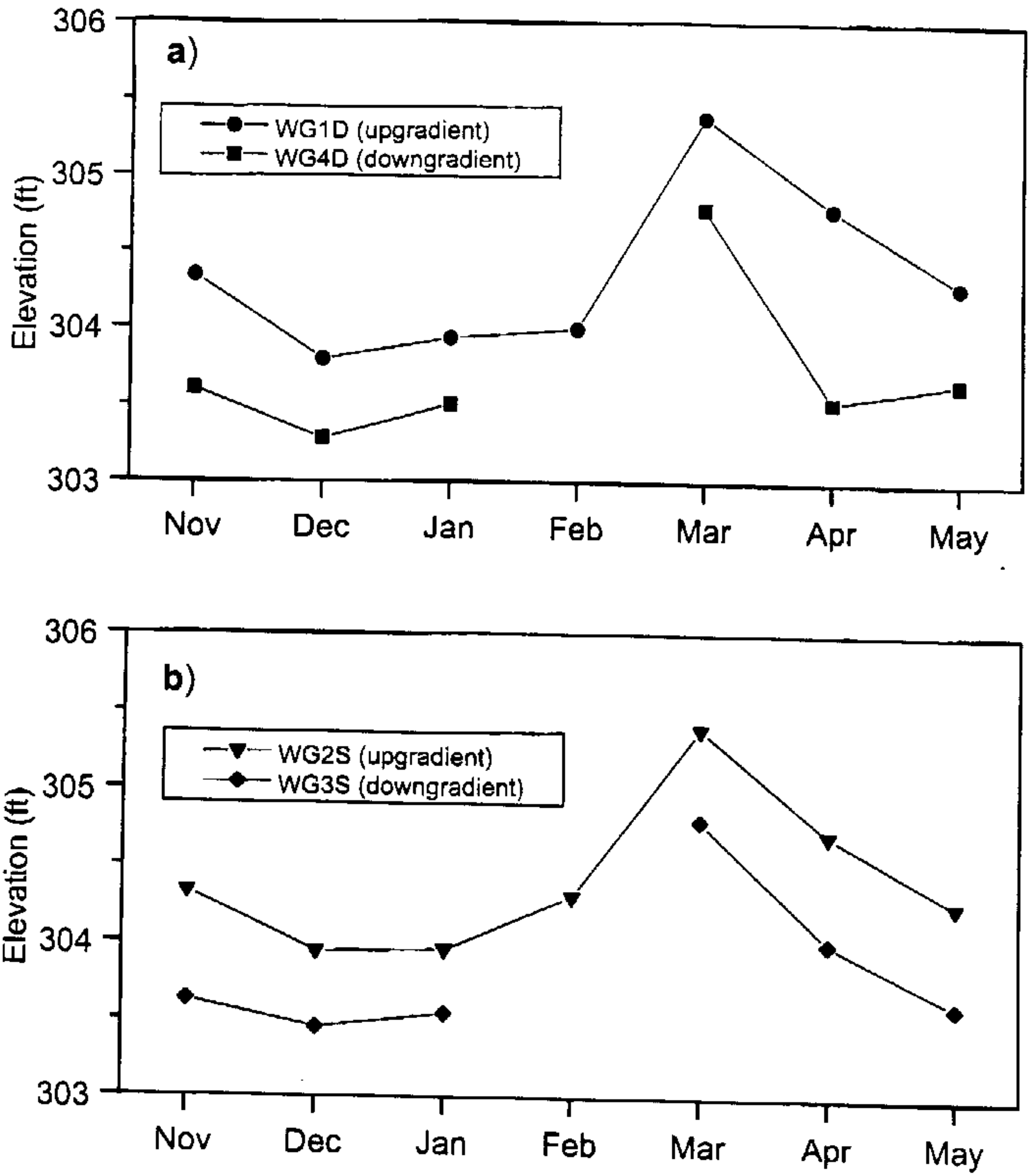


Figure 3. Measured groundwater water elevations in monitoring wells located on the upgradient and downgradient side of Gate W: a) deep wells, b) shallow wells.

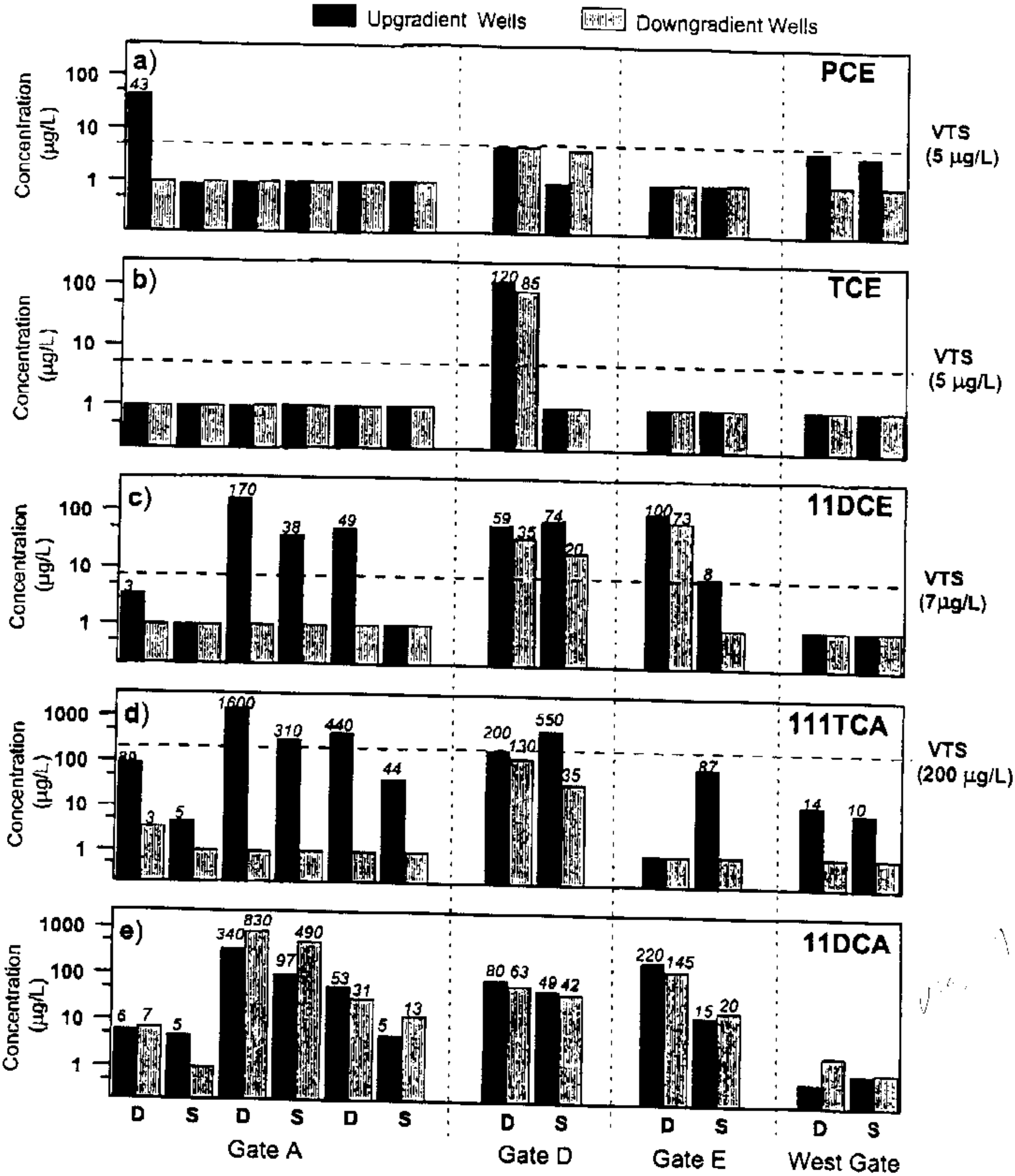


Figure 4. Concentrations of VOCs detected in Nov. 1998 in groundwater monitoring wells located along the transects of four iron gates at the Hercules site, VT: a) PCE, b) TCE, c) 1,1-DCE, d) 1,1,1-TCA, and e) 1,1-DCA. The Vermont groundwater standard (VTS) for each compund is indicated by the dashed lines. D - transect of wells completed in the deep part of the aquifer, S - transect of wells completed in the shallow part of the aquifer.

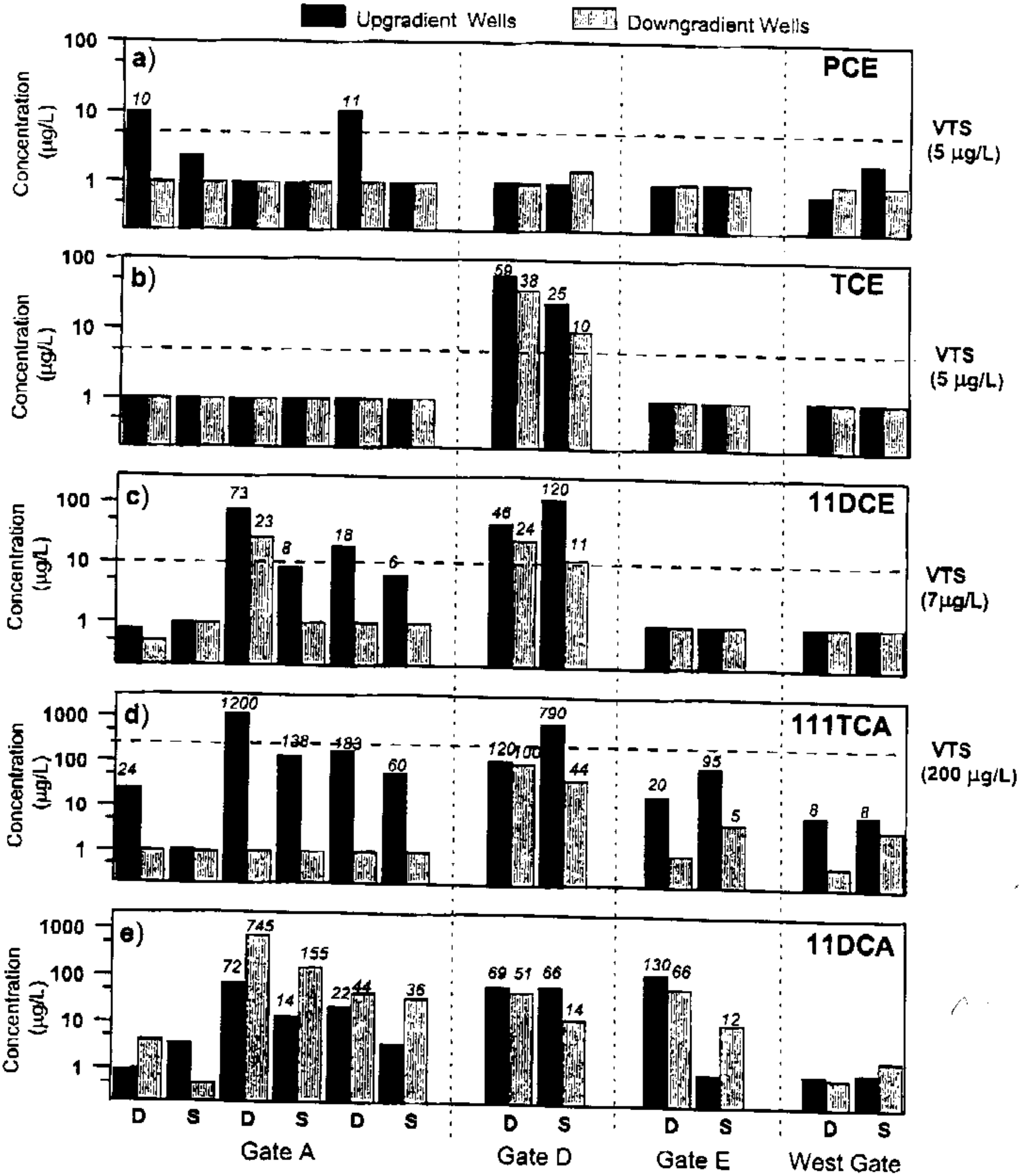


Figure 5. Concentrations of VOCs detected in March 1999 in groundwater monitoring wells located along the transects of four iron gates at the Hercules site, VT: a) PCE, b) TCE, c) 1,1-DCE, d) 1,1,1-TCA, and e) 1,1-DCA. The Vermont groundwater standard (VTS) for each compund is indicated by the dashed lines. D - transect of wells completed in the deep part of the aquifer, S - transect of wells completed in the shallow part of the aquifer.

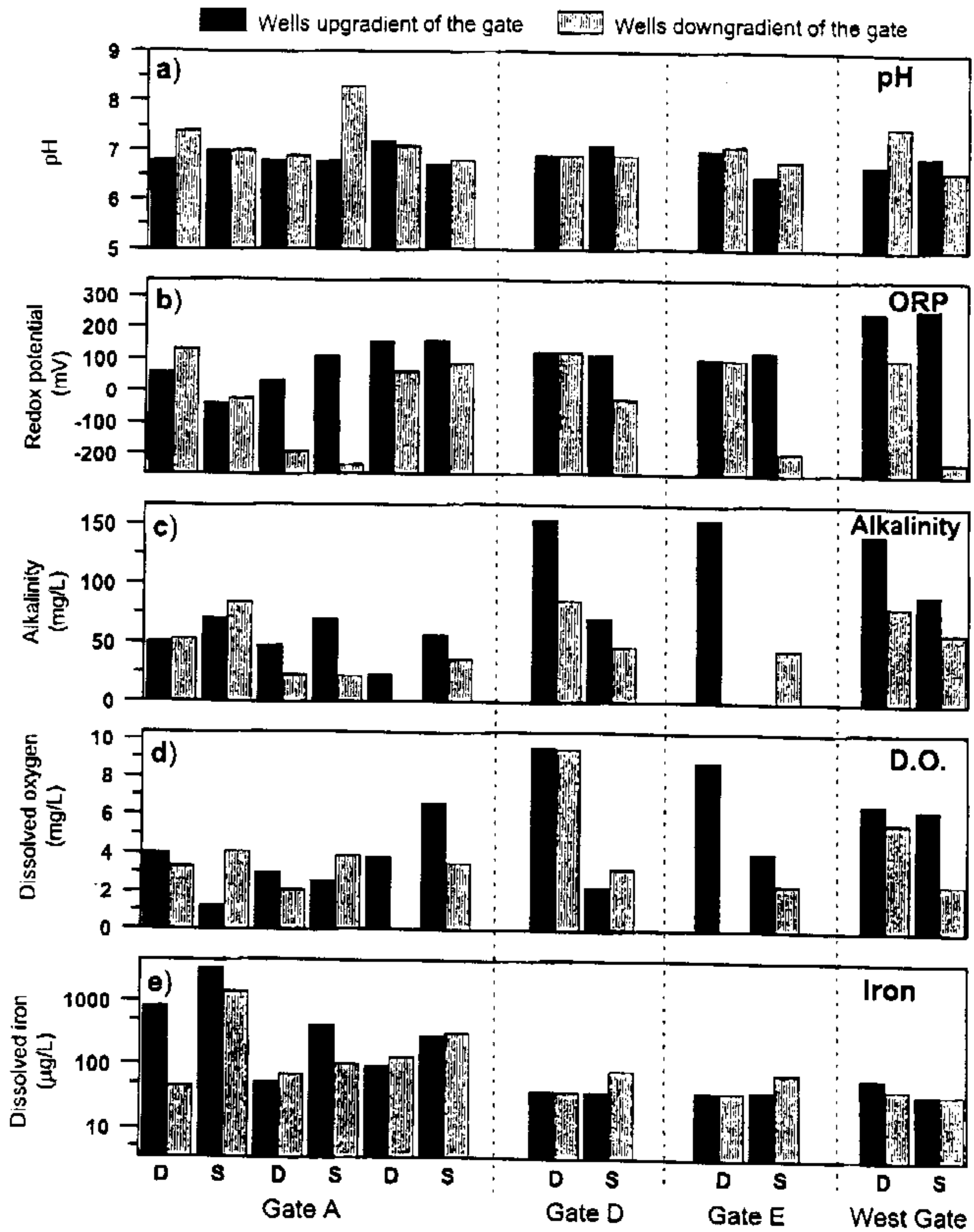


Figure 6. Selected inorganic parameters measured in Nov. 1998 in groundwater monitoring wells located on upgradient and and downgradient site of four iron gates at the Hercules site, VT: a) pH, b) Oxidation-reduction potential, c) Total alkalinity, d) dissolved oxygen, and e) dissolved iron concentration. D - transect of wells completed in the deeper part of the aquifer, S - transect of wells completed in the shallower part of the aquifer.

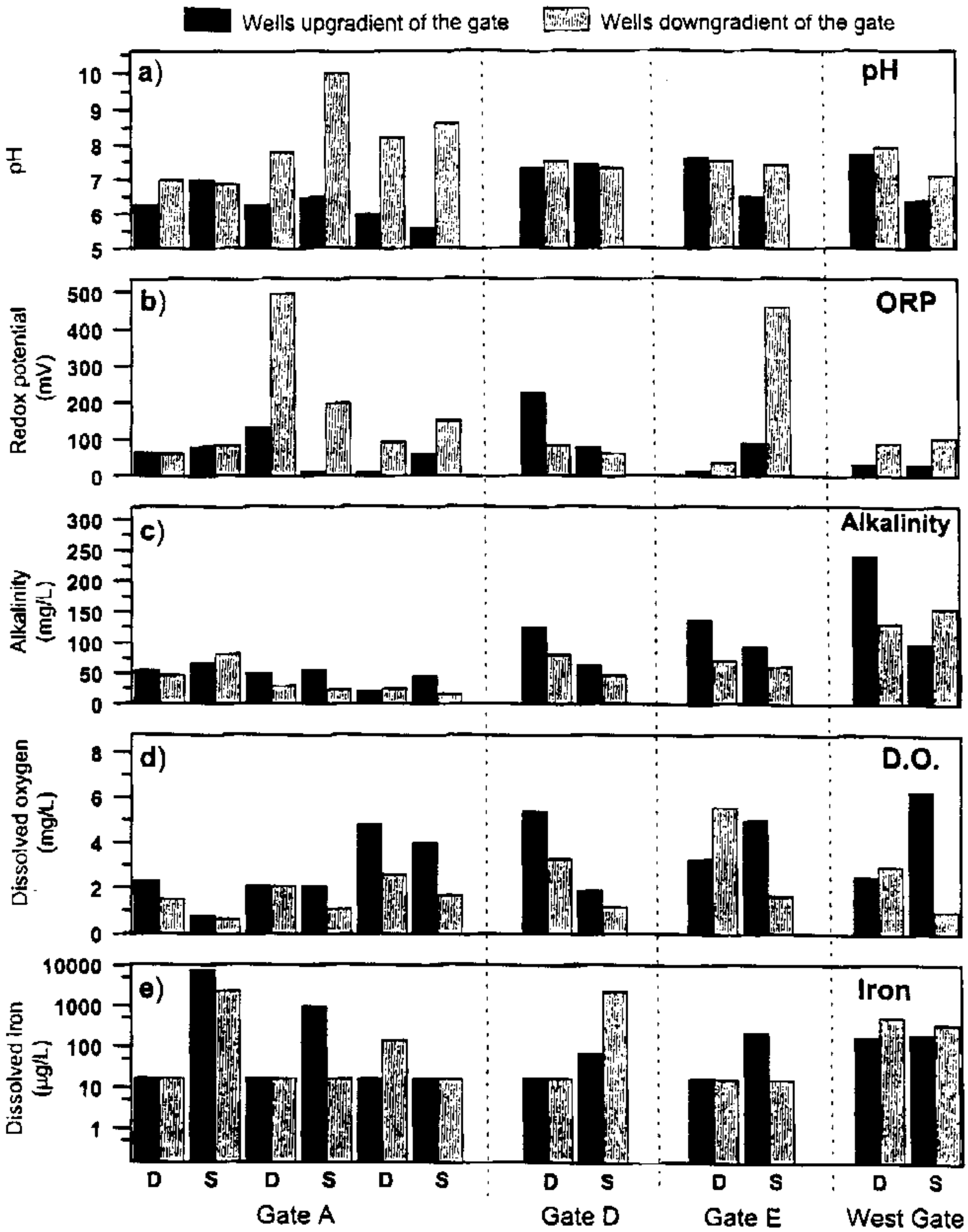
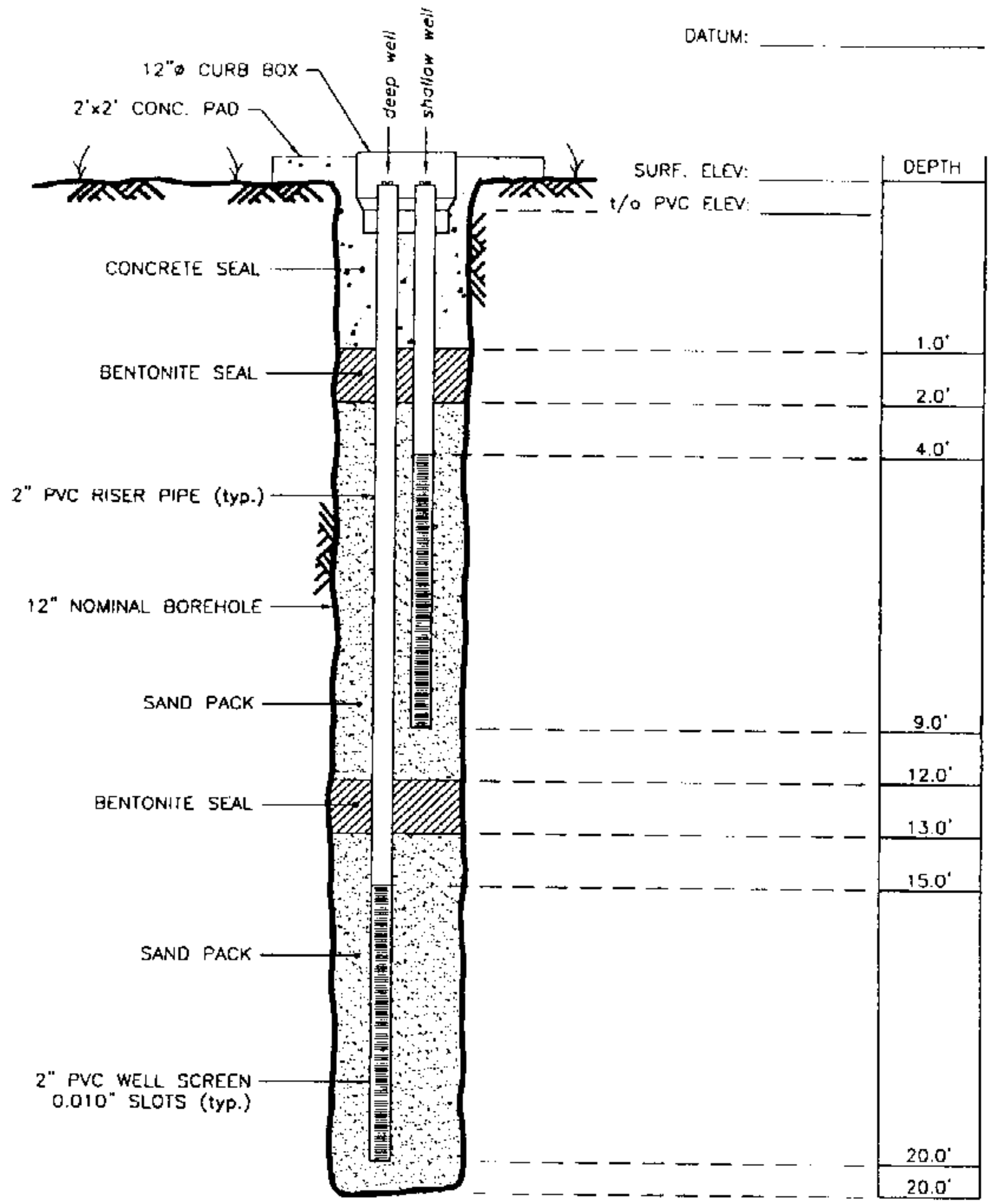


Figure 7. Selected inorganic parameters measured in March 1998 in groundwater monitoring wells located on upgradient and and downgradient site of four iron gates at the Hercules site, VT: a) pH, b) Oxidation-reduction potential, c) Total alkalinity, d) dissolved oxygen, and e) dissolved iron concentration. D - transect of wells completed in the deeper, S - transect of wells completed in the shallower part of the aquifer.

APPENDIX B

Maxim Technologies Inc.
Soil Boring Logs & Well Details



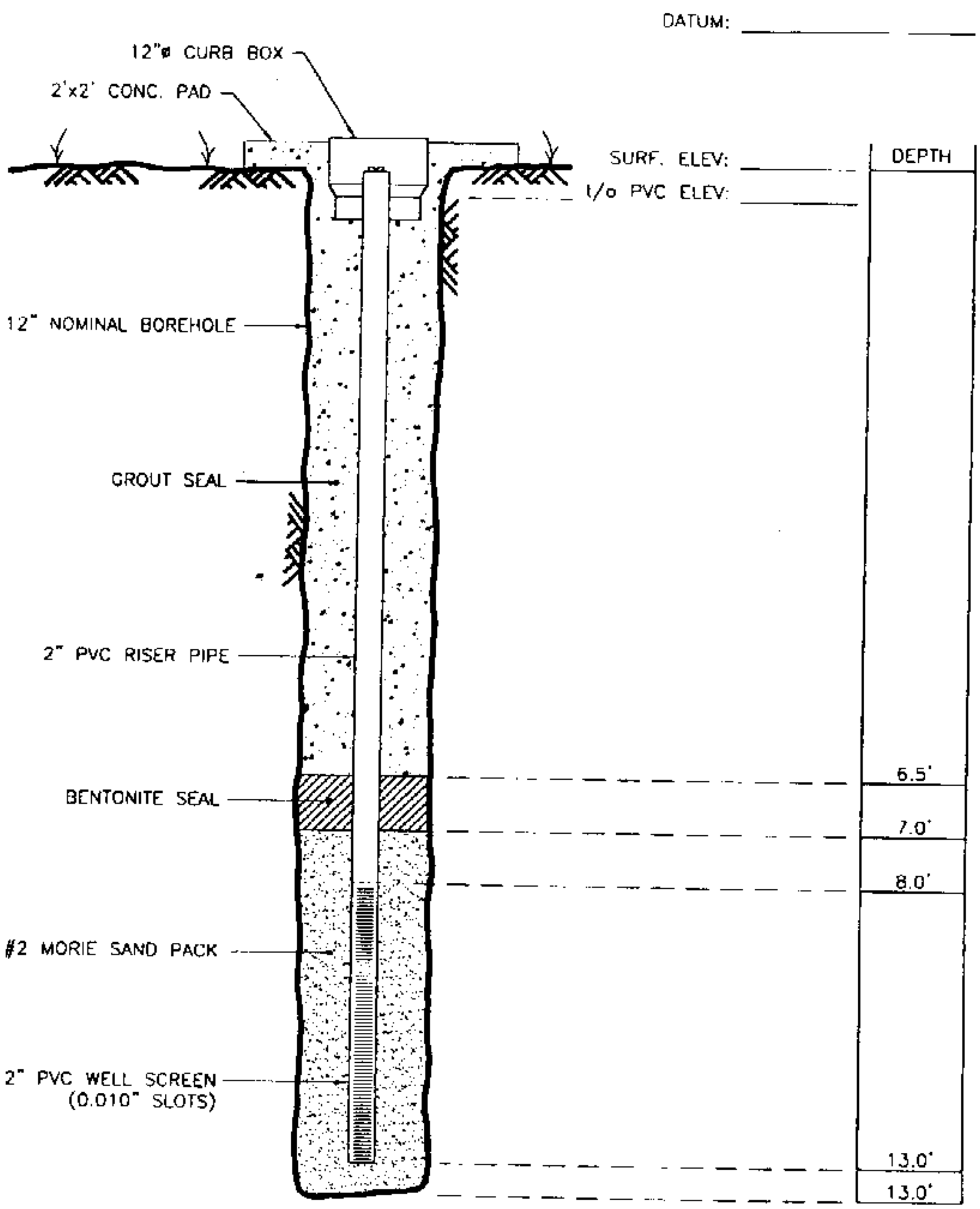
WELL No.
DG5D & DG6S
(downgradient)

MAXIM
TECHNOLOGIES INC
Maxim Technologies of New York, Inc.

MONITORING WELL DETAILS

CHAMPLAIN CABLE REMEDIATION SITE
SITE NUMBER VT DEC 770046
COLCHESTER, VERMONT

SCALE:	NOT TO SCALE
DATE:	5/00
DRAWN BY:	JSH
REV'D BY	
DWG. FILE	dg5
PROJ. No	2000114
DRAWING No.	



WELL No.
AG13D
(downgradient)

MAXIM
TECHNOLOGIES INC
Maxim Technologies of New York, Inc.

MONITORING WELL DETAILS

CHAMPLAIN CABLE REMEDIATION SITE
SITE NUMBER VT DEC 770046
COLCHESTER, VERMONT

SCALE:	*NOT TO SCALE*
DATE:	*5/00*
DRAWN BY:	*JSH*
REV'D BY:	
DWG. FILE:	*ag13d*
PROJ. No.:	*2000114*
DRAWING No.:	

APPENDIX C

ETI Letter of November 15, 2000

enviro**metal** technologies inc.

Champlain Cable

Memorandum

To: Glen H. Schmiesing, Hercules, Inc., Fax No: 302-594-7255

From: Andrzej Przepiora, John Vogan, EnviroMetal Technologies Inc.

Date: 15 November 2000

Re: **Comments on September 2000 Groundwater Monitoring Data, Champlain Cable Corporation Site, Colchester, VT – 31176.77**

EnviroMetal Technologies Inc. (ETI) has received from Hercules, Inc. recent groundwater monitoring data for an in-situ permeable reactive barrier (PRB) treatment system installed at the Champlain Cable Corporation Site, Colchester, VT. The data included groundwater level measurements and concentrations of selected chlorinated volatile organic compounds (CVOCs) obtained in June and September 2000.

The iron PRB was installed in a funnel and gate configuration, whereby four permeable walls or gates (Gates A, D, E and West) with interconnected HDPE funnels treat CVOC contaminated groundwater. The monitoring well network for Gate A consists of 3 transects across the treatment system (the eastern, middle and western). For Gates D, E and W, one transect in the middle of the treatment system was monitored. Each transect consists of two pairs of wells completed in the deep (silt) and shallow (sand) part of the water table aquifer. The upgradient and downgradient wells are located 5 ft and 1 ft from the gates, respectively. Additional monitoring wells inside the iron zones were installed before the June 2000 sampling at Gate A (deep gate well) and Gate D (deep and shallow gate wells).

Groundwater flow through the gates

Table 1 shows the hydraulic head differences along the gate transects based on the water levels measured in June and September 2000. The hydraulic head differences along most of the well transects indicate the groundwater flows through the treatment zones consistent with the previously determined groundwater flow direction. However, the measurements along the deep well transect at Gate A (AG9D-AG12D) and Gate E (EG2D-EG4D) indicate a reversed hydraulic gradient at these locations in June 2000 (Table 1). Comparing the water level data in all monitoring wells at these gates, it appears that water elevations in June 2000 in wells AG12D and EG2D are anomalous. No anomalous groundwater levels were observed in

745 Bridge St. W., Suite 7
Waterloo, Ontario
Canada N2V 2G6
Tel (519) 746-2204
Fax (519) 746-2209

September 2000 (Table 1), which, as we understand, can be attributed to the redevelopment of the monitoring wells in the system before the September 2000 monitoring.

Based on the hydraulic gradients measured in September 2000 and the hydraulic conductivities from tracer tests (CAP, 1998), groundwater velocities for the last monitoring period were estimated (Table 2). Similar to the groundwater velocities obtained based on the previous monitoring data, the estimated values are significantly higher (up to 36-fold higher in the deep aquifer and up to 12-fold higher in the shallow aquifer) than the velocities estimated based on the water balance at the site (CAP, 1998). The residence times in the deep part of the aquifer appear equal to or higher than the design residence times in Gates A, D and E (Table 2). In Gate A and W, the residence times in the shallow aquifer appear to be lower than the design values (Table 2).

VOC concentrations

Table 2 indicates the number of pore volumes (PV) that had passed between the upgradient face of the gates and the downgradient monitoring wells at the end of the monitoring period (October 1999). It has been ETI's experience that steady state (i.e. the optimal removal efficiency) is usually established in the iron system after about 40 PV. By September 2000, the number of pore volumes that had passed between the gate and the downgradient well was less than 40 only in the deep well transect at Gate D (Table 2).

Similar to the approach taken by ETI in the previous data interpretation, the concentrations flagged "U" in the analytical report were considered as non detects (i.e. set to 1 µg/L) for interpretation of the VOC data at the site (Figure 1 and 2). Note that the reported laboratory detection limits ranged from 0.5 to 100 µg/L for data collected in June 2000 and from 0.5 to 5 µg/L for data collected in September 2000.

Based on the June and September 2000 monitoring data, all CVOCs entering Gates E and W are treated to below the target cleanup levels (Figure 1 and 2). These results are consistent with analytical data obtained during previous monitoring events.

Previous monitoring results at the site have shown that some CVOC concentrations in downgradient wells at Gates A and D have not met the target cleanup levels. As indicated in our previous correspondence, ETI believes (based on experience at other installations) that the contaminants are treated in the gate and the observed downgradient levels are the result of residual contamination caused by contaminant desorption and/or incomplete flushing in the aquifer material. The influence of residual contamination on downgradient CVOC concentrations can be discerned based on examination of temporal trends in CVOC concentrations along well transects in the system. For example, in the middle well transect at

Gate A, the 11DCA concentration in the downgradient well remained relatively constant in six sampling events, whereas the 111TCA (a parent compound forming 11DCA) concentrations varied from 1,200 to 3,900 µg/L in the same period (Figure 3). If the degradation of 11DCA was not adequate in the gate, knowing that the residence time in the gate did not changed significantly over time, it would be expected that the 11DCA trend would follow the trend of 111TCA.

Based on ETI's recommendation, a cluster of monitoring wells was installed in the downgradient section of Gate A and D. Results obtained from these wells, if installed and developed properly, should not be influenced by the residual contamination.

In Gate D, the downgradient CVOC concentrations appear to exceed the cleanup target levels, especially in wells screened in the deep aquifer (Figures 1 and 2). In fact, in both sampling events, the concentrations of 11DCE, 111TCA and 11DCA in the deep downgradient wells were higher than the upgradient concentrations (Figures 1 and 2). However, the results obtained from wells located in the iron zone show that indeed the concentrations of all contaminants in the treated groundwater were reduced to below the target levels (Figure 1 and 2). As indicated above, the CVOC levels measured in the wells installed within the iron zone appear representative of groundwater treated by granular iron and unaffected by residual contamination, and thus we conclude that the groundwater exiting Gate D meets the target cleanup levels for all CVOCs.

The concentrations of PCE, TCE and 111TCA in the downgradient wells at Gate A were below the target cleanup levels in both sampling events (Figure 1 and 2). However, the downgradient concentrations of 11DCE and 11DCA measured in the middle deep well exceeded the target cleanup levels (Figure 1 and 2). The 11DCE concentrations in the deep transect were reduced from upgradient values of 150 and 300 µg/L to downgradient values of 21 and 8 µg/L in June and September, respectively. In the same transect, the 11DCE concentration measured in the deep well inside the gate were 5 and 14 µg/L in June and September, respectively.

The downgradient 11DCA concentrations at Gate A were also above the target cleanup level in the middle deep aquifer monitoring well (Figure 1 and 2). In this transect, the upgradient concentrations were non-detect and 182 µg/L, whereas the downgradient concentration equaled 330 and 690 µg/L in June and September, respectively. Note that the sample taken concurrently from the well installed inside the gate, as a part of this deep transect, showed 11DCA concentrations of 160 and 190 µg/L for the two sampling event, respectively (Figure 1 and 2). Both of these concentrations are lower than the corresponding downgradient aquifer concentrations. As indicated in our previous correspondence, 11DCA is produced during dechlorination of 111TCA and accounts for about 40% of 111TCA breakdown products. Assuming this conversion rate (which was observed in numerous laboratory tests) and the incoming concentration of 111TCA ranging from 3,000 to 3,900 μg/L (Figure 1 and 2), about 1,200 to 1,500 μg/L was likely formed inside the iron zone. The low 11DCA concentrations measured in wells inside and downgradient of the gate, compared to these peak values generated from the 111TCA breakdown, indicate that the 11DCA degradation does occur inside the gate. At the present time, we cannot explain why the degradation of 11DCA in the deep zone appears incomplete. Based on groundwater monitoring, the residence time at Gate A is about 11 days (Table 2). We are convinced that this residence time would be sufficient for complete degradation of up to 1,500 μg/L of 11DCA. For example, assuming the design 11DCA half-life of about 40 hrs, about 8 days would be required to degrade 1,500 μg/L of 11DCA to below 70 μg/L. One possible explanation could be that the well installed inside the iron zone is located in the central part of the gate, rather than in the downgradient part, and therefore the sample from this well is not representative of groundwater flowing through the entire thickness of the gate. This hypothesis is supported indirectly by the concentrations of 111TCA measured in the gate well. The 111TCA is known to have the shortest half-life (about 2.5 hr) among the CVOCs present at the site, and thus it is almost certain that this compound would not be detected in the downgradient part of the iron zone with an 11-day residence time. However, the 111TCA concentrations in the gate well ranged from 7 to 30 μg/L (Figure 1 and 2). At the time of this memorandum, we do not have information regarding the exact location of the gate well in relation to the downgradient boundary of the iron zone and we cannot exclude this possibility. Based on communications with Hercules Inc., the iron well locations were selected by conducting a series of soil borings from the downgradient side towards the gate until the iron zone was detected. Since Gate A consists of two iron zones, a 30-in wide 100% iron zone and a 14-in wide 70% iron/sand mix zone, it is possible that the iron/sand mix was not detected and the well was installed in the 100% iron zone. We recommend the location of the iron well be determined accurately. Additionally, the monitoring data for both sampling events shows that about 4 gallons of groundwater were removed from the iron wells before the sample collection. We understand that this large purging volume is required by the sampling procedure, however, we believe this procedure could have resulted in a sample not representative of the zone in the vicinity of the iron well. We recommend that a low-flow sampling procedure be used to obtain the samples from iron wells.

Summary

- The groundwater level monitoring in June 2000 indicated some anomalous water levels at Gates A and E. The levels measured in September 2000, after the well redevelopment, show a consistent groundwater flow through all gates in the system.

- Based on the June and September 2000 analytical data, all CVOCs are treated to below the target cleanup levels at Gates E and W. The PCE, TCE and 111TCA at Gates A and D are degraded to below the TCLs. The concentrations of 11DCE and 11DCA in deep downgradient wells at Gates A and D were above the target cleanup levels for these compounds.

- The concentrations of CVOC detected in the newly installed wells inside Gate A and D show that concentrations in the downgradient wells may still be affected by contaminant desorption from aquifer material and/or inadequate flushing in the aquifer material. Based on analytical data from the newly installed wells inside Gate D, all CVOCs are degraded by granular iron to below the target cleanup levels. The 11DCE and 11DCA concentrations inside Gate A were lower than the downgradient concentrations, but both compounds exceeded the target cleanup levels.

Table 1. Head differences in the transect wells, based on the water level measurements in June and September 2000.

Transect wells	June 2000		September 2000	
	In-out head difference (ft)	Hydraulic gradient	In-out head difference (ft)	Hydraulic gradient
Gate A				
AG1D → AG3D	1.69	0.133	1.34	0.106
AG2S → AG4S	1.2	0.095	-	-
AG6D → AG8D	2.16	0.171	1.69	0.133
AG5S → AG7S	2.16	0.171	1.67	0.132
AG9D → AG12D	-1.23	-0.097	1.52	0.120
AG10S → AG11S	1.77	0.140	1.45	0.114
Gate D				
DG1D → DG4D	0.16	0.022	0.35	0.049
DG2S → DG3S	0.38	0.053	0.15	0.021
Gate E				
EG2D → EG4D	-4.1	-0.572	0.31	0.043
EG1S → EB3S	0.75	0.105	0.61	0.085
Gate W				
WG1D → WG4D	1.18	0.165	0.71	0.099
WG2S → WG3S	1.11	0.155	0.65	0.091

Table 2. Parameters for groundwater movement through the gates, based on the September 2000 monitoring data.

Gate	Well completion	GW velocity from hydraulic gradients[a] (ft/d)	GW velocity from water balance (CAP, 1998) (ft/d)	Design residence time (100% iron)[b] (days)	Residence time in gates[c] (days)		Number of pore volumes passed[d] (September 00)	
					Based on GW velocity from gradients	Based on GW velocity from water balance	Based on GW velocity from gradients	Based on GW velocity from water balance
Gate A	Deep	0.31	0.04	1.9	10.7	83	334	6.2
	Shallow	5.87	0.69	4.6	0.57	4.8	1833	107
Gate D	Deep	0.011	0.004	3.1	31.8	87.5	27	0.6
	Shallow	0.085	0.07	2.7	4.1	5	66	10.9
Gate E	Deep	0.036	0.01	1.3	32.5	117	50	1.6
	Shallow	3.19	0.50	NTR	0.4	2.3	597	-
Gate W	Deep	0.34	0.03	6.9	1.7	19.3	53	4.7
	Shallow	5.53	0.48	6.9	0.1	1.2	607	75

[a] Hydraulic conductivities averaged from tracer tests as reported in CAP, 1998 (Tables 6 and 7, vol. 1), effective porosity of 0.3 assumed

[b] As reported in the CAP, 1998 (Apendix C, Tables II to IX, vol. 1)

[c] Adjusted for 100% iron where an iron/sand mixture was used (Gate A - 30 in. of 100% iron and 14 in. of 70% iron, Gate D - 14 in. of 30% iron, Gate E - 14 in. of 100% iron, Gate W - 14 in. of 50% iron), ranges for two velocities in the previous two columns

[d] Pore volumes based on the distance between the upgradient face of the wall and the downgradient monitoring well (4.7 ft in Gate A and 2.2 ft in Gates D, E and W)

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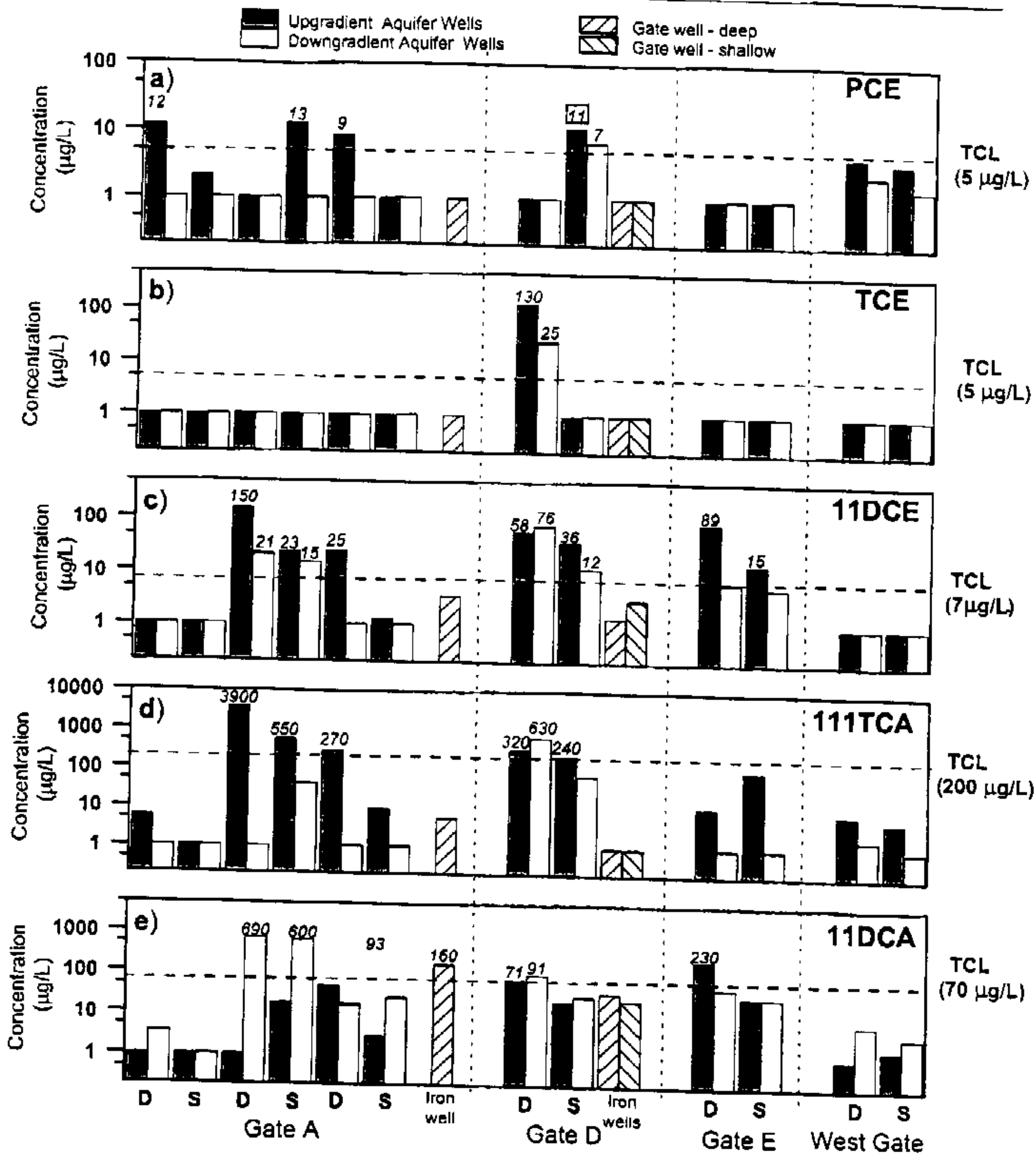

Figure 1. Concentrations of VOCs detected in June 2000 in groundwater monitoring wells located along the transects of four iron gates at the Champlain site, VT: a) PCE, b) TCE, c) 11DCE, d) 111TCA, and e) 11DCA. The target cleanup level (TLC) for each compound is indicated by the dashed lines. D - deep transect wells, S - shallow transect wells. Numerical values with a border indicate concentrations exceeding the maximum design values.

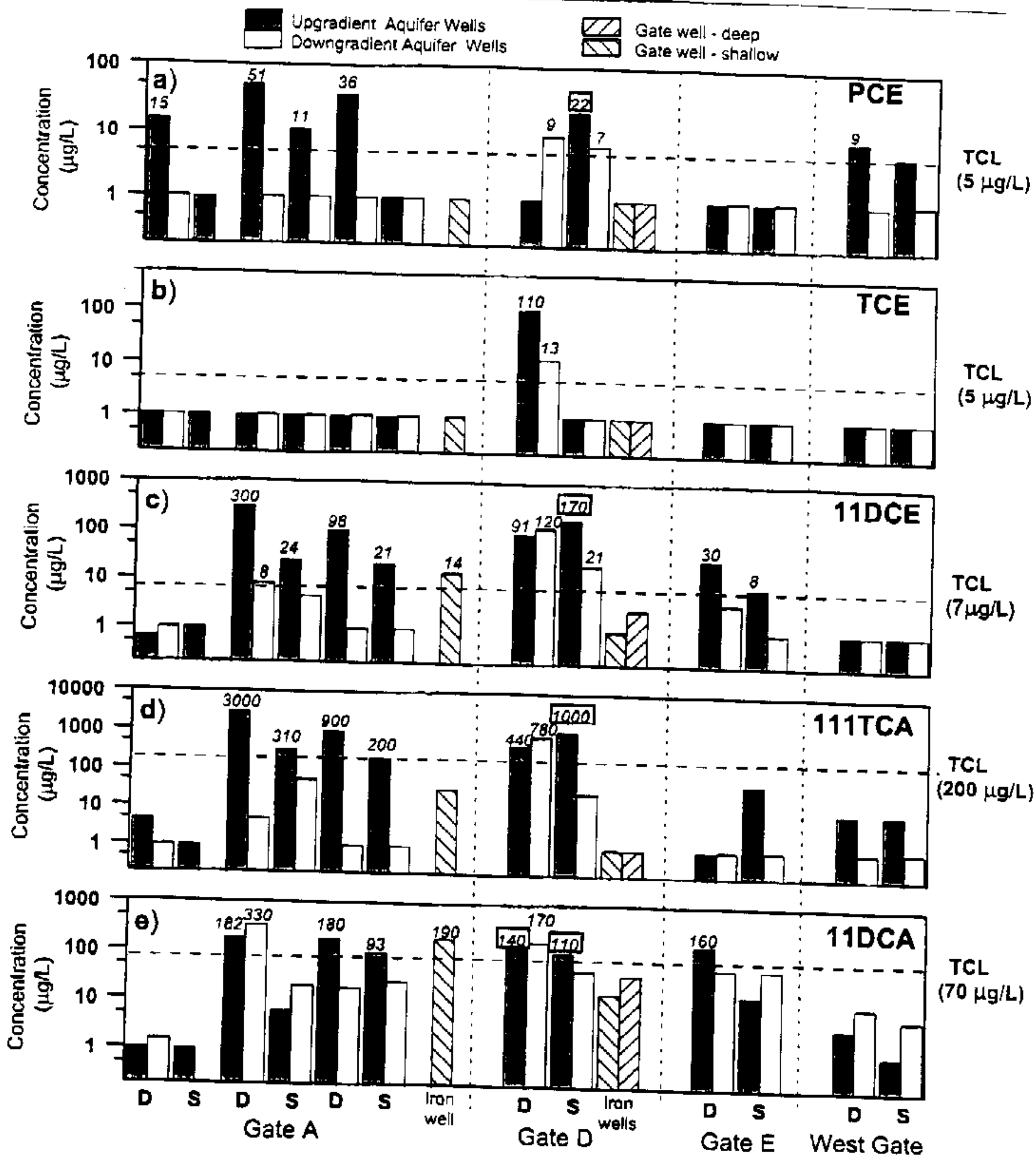

Figure 2. Concentrations of VOCs detected in September 2000 in groundwater monitoring wells located along the transects of four iron gates at the Champlain site, VT: a) PCE, b) TCE, c) 11DCE, d) 111TCA, and e) 11DCA. The target cleanup level (TLC) for each compound is indicated by the dashed lines. D - deep transect wells, S - shallow transect wells. Numerical values with a border indicate concentrations exceeding the maximum design values.

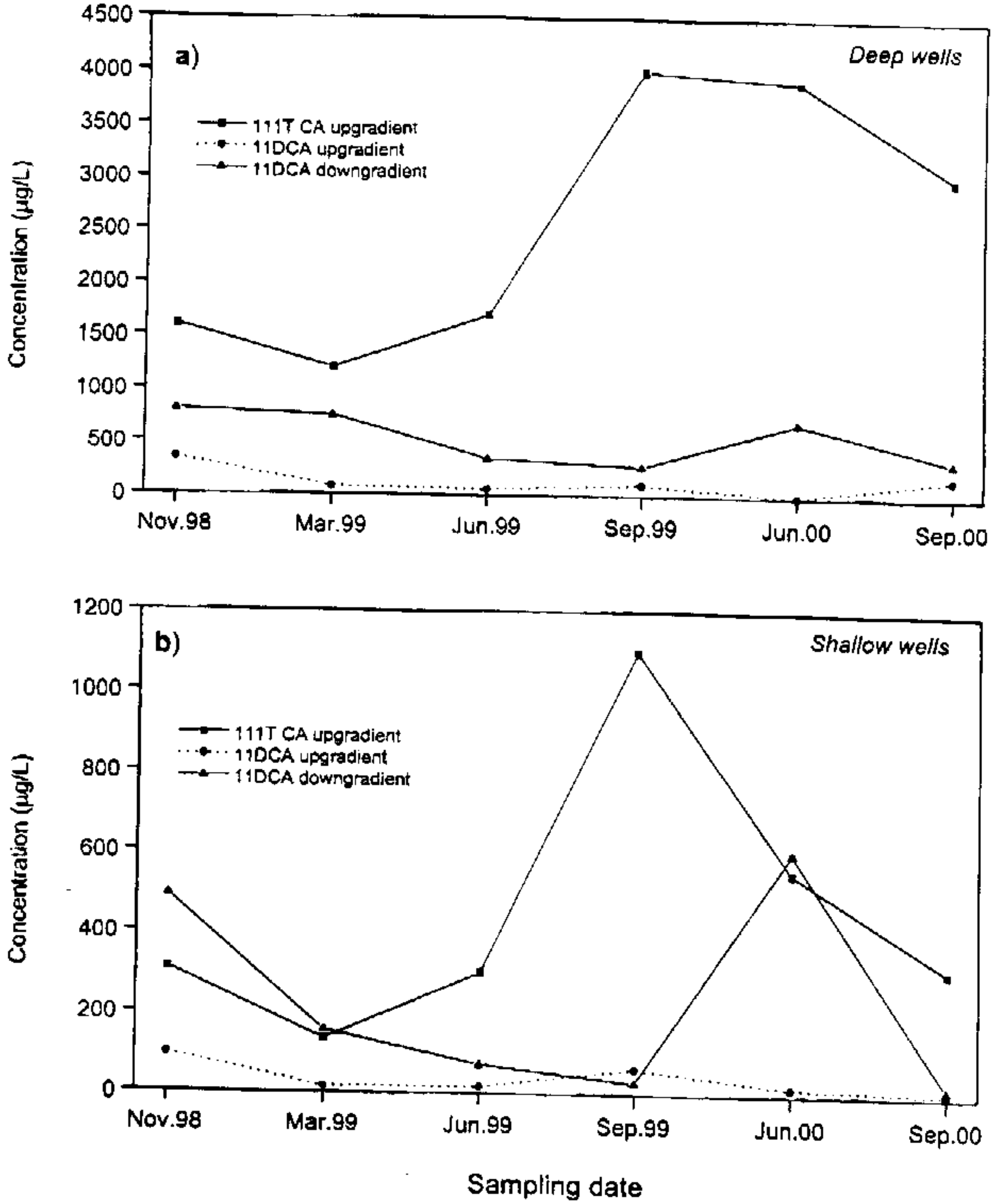

Figure 3. Temporal variation of 111TCA and 11DCA concentrations along the middle well transect at Gate A: a) deep well transect; b) shallow well transect.